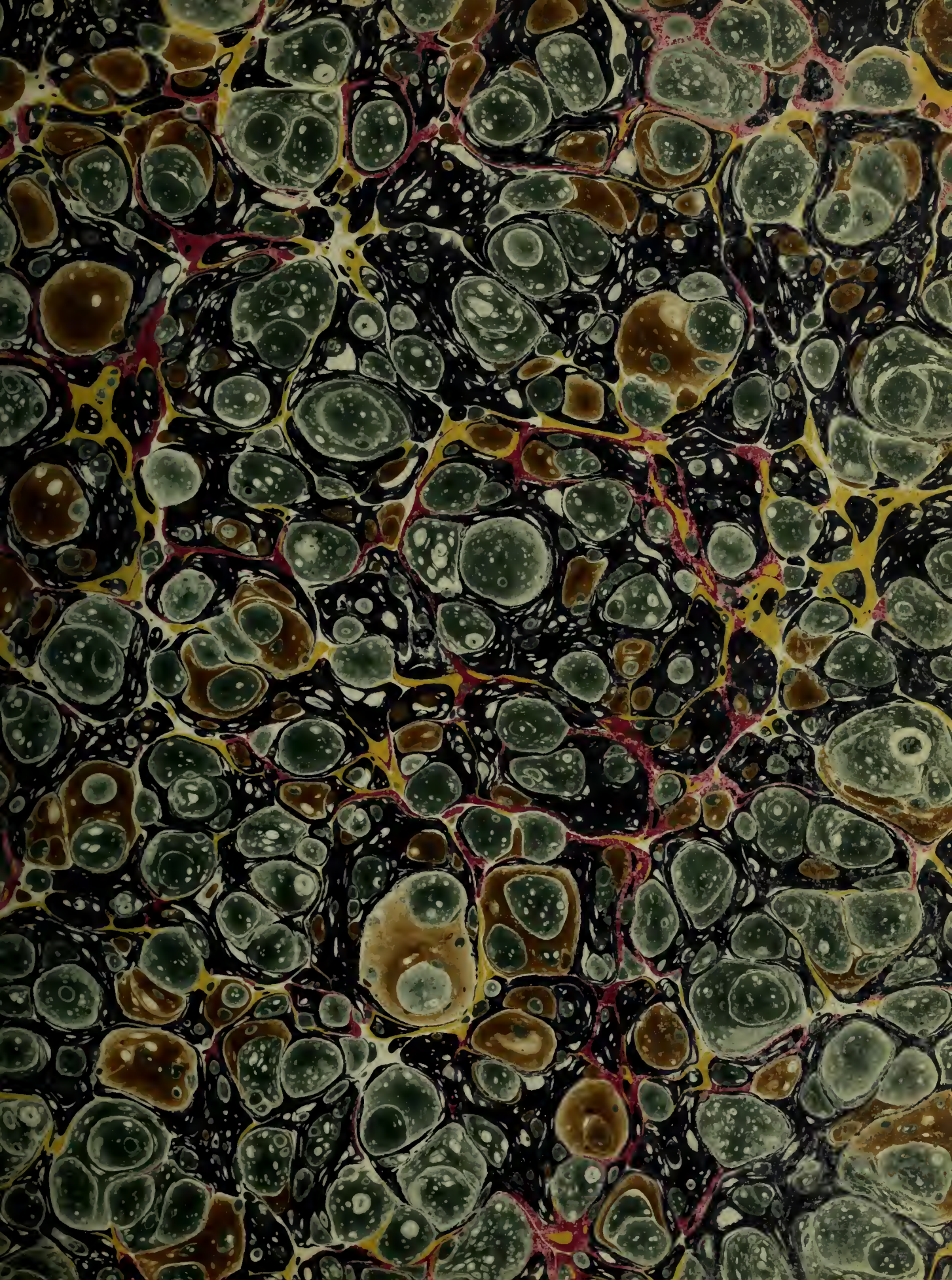


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THE
CYCLOPÆDIA;
OR,
Universal Dictionary
OF
ARTS, SCIENCES, AND LITERATURE.

VOL. XIX.

THE
CYCLOPÆDIA;

OR,

UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

ABRAHAM REES, D.D. F.R.S. F.L.S. *S. Amer. Soc.*

WITH THE ASSISTANCE OF

EMINENT PROFESSIONAL GENTLEMEN.



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IN THIRTY-NINE VOLUMES.

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CYCLOPÆDIA:

OR, A NEW

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OF

ARTS and SCIENCES.

INCREMENTS.

INCREMENTS, METHOD OF, called by the French *Calcul des Différences Finies*, is a branch of analysis invented by the learned Dr. Brook Taylor, particularly useful in the summation of series, and applicable to several subjects of mathematical investigation, where scarcely any other method can be successfully employed. Montucla observes, that had the human mind always pursued the path which appears the most natural, the theory of increments, or of finite differences, would have preceded that of fluxions, or the differential calculus; as it seems more natural for the mind to be carried from the consideration of finite differences, to that of differences indefinitely small, than that the latter should be the precursor of the former. Such, however, was the fact; for the first distinct notions of the method of increments did not appear till the year 1715, in a work entitled "*Methodus Incrementorum*," &c. by Dr. Brook Taylor, in which both the direct and inverse method of increments are treated of in a very learned manner, and an application of the same to various interesting problems; but the novelty of the subject, and the concise mode of expression employed by its author, together with the very complicated notation, rendered the work nearly unintelligible to any man less skilled in analysis than the author himself; even the enunciation of some of the propositions requires the greatest possible attention in order to comprehend their meaning; but in other respects, the work bears strong and evident marks of the lofty genius of its author, and contains, in the second part, many very excellent applications of the preceding theory to the solution of some of the most interesting and celebrated mathematical problems. Such, however, being the intricacy of the original work, it necessarily follows that it could only be read by the very first rate ma-

thematicians; and it was therefore fortunate that any of them would condescend to illustrate a subject in which they could only act a secondary part; such a person was however found in M. Nichol, of the Royal Academy of Sciences, who, having very early been in possession of a copy of Dr. Taylor's work, and perceiving, at once, its general utility, he undertook the task of illustrating the principles upon which it rested; and, by simplifying the notation and operations, rendered it intelligible to readers of an inferior order: his first paper on the subject was published in the *Memoirs of the Academy* for 1717, which was afterwards followed by two others in 1723 and 1724. Dr. Taylor himself also, in the *Philosophical Transactions*, undertook an explanation of certain parts of his work, and its farther application to some kinds of series beyond those treated of in the original: the same was also done by M. Montmort, in the *Transactions* for the years 1719 and 1720; which latter gentleman, it seems, had conceived some idea of the theory before Dr. Taylor's work appeared; and a trifling altercation took place between them as to the originality of some of the notions which was claimed by both parties. In 1763, Emerson published his "*Method of Increments*;" a work which, at least, does this author as much credit as any that he ever produced; but the notation resembles, in a great measure, that of Dr. Taylor, which renders it now almost obsolete. Emerson appears to have been extremely anxious to bring the theory of increments to perfection; and earnestly urged those who were qualified for the task, to pursue the paths he had opened to them. "I cannot," says he, "promise that I shall have time and leisure hereafter to prosecute this subject any farther. And as I have an earnest desire of advancing truth and improving science, let me here-

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entreat

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entreat the friendly mathematicians, who are lovers of science, to lend their kind assistance for the advancement of this uncultivated branch of knowledge, yet in its infancy, or rather, as yet, in the hands of Lucina, either according to the model I have here laid before them, or some better if it can be found, so that, by degrees, it may at length be brought to perfection." Hence it appears that this author was, in 1763, sensible of the neglect that had been paid to the theory of increments; and even now, near half a century after this date, the subject has not been advanced, nay scarcely touched upon by any English mathematician, while foreign authors are filling quarto volumes with the theory of *differences finies*, and its almost universal application to the most curious and important of mathematical inquiries. Euler, whose universal genius led him to the investigation of every subject that was useful and interesting, did not leave the theory of increments untouched, but has treated of it, in his usual masterly style, in a work entitled "Institutiones Calculi Differentialis," &c. in which he has given a new form, and much extended the bounds of this important branch of analysis: and subsequent authors have adopted his ideas, and rendered permanent the form he gave it. Various other works have since appeared to illustrate and render familiar the principles of this doctrine; the most complete of which is the "Traité des Différences," &c. par Lacroix. Boffut has likewise a chapter on this subject in his "Traité des Calcul Différentiel," where the theory is treated in a very elementary and comprehensive manner; and the same is also done by Cousin, in chapter 3. of the introduction to his "Traité des Calcul Différentiel," &c.

Having thus given a brief sketch of the history and progress of the method of increments, we shall now endeavour to explain the principles and application of it: in order to which, that we may prepare the reader for the more general theory, it will be useful to consider the same in a more limited form in the first instance, in doing which we cannot have a better model than that of M. Nichole above-mentioned.

The method of this author is extremely simple, but certainly less general than that of Dr. Taylor; it is, however, well calculated for conveying the first clear and connected ideas of this theory, and prepares the reader for more general researches, by leading him on, from step to step, with order and precision.

If we consider x as any variable quantity, which is continually increased by a constant quantity n , so that it becomes successively $x, x + n, x + 2n$, &c.: and if y be any function of x , made up of factors, as $y = x(x + n)(x + 2n)(x + 3n)$, then the difference between this value of y , and that which it becomes when x is again increased by n , is the increment of y , or of $x(x + n)(x + 2n)(x + 3n)$; which increment is readily obtained, by observing, that

$$\begin{aligned} (x + n) &- x \dots \dots \dots = n \\ (x + n)(x + 2n) &- x(x + n) = 2n(x + n) \\ (x + n)(x + 2n)(x + 3n) &- x(x + n)(x + 2n) = 3n(x + n)(x + 2n); \text{ and hence generally, the increment of } x(x + n)(x + 2n) \dots (x + rn) = (r + 1)n(x + n)(x + 2n) \dots (x + rn): \text{ And hence again conversely, the integral of } (r + 1)n(x + n) \dots (x + 2n)(x + rn) = n(x + n)(x + 2n) \dots (x + rn); \text{ or more generally, the integral of } x(x + n)(x + 2n) \dots (x + rn) \\ &= \frac{(x - n)x(x + n)(x + 2n) \dots (x + rn)}{(r + 2)n}: \text{ Again,} \end{aligned}$$

the increment of x^m is the difference between x^m and $(x + n)^m$. Now $(x + n)^m - x^m = mx^{m-1}n + \frac{m(m-1)}{1 \cdot 2}x^{m-2}n^2 + \frac{m(m-1)(m-2)}{1 \cdot 2 \cdot 3}x^{m-3}n^3 + \&c.$; and

$$x^{m-2}n^2 + \frac{m(m-1)(m-2)}{1 \cdot 2 \cdot 3}x^{m-3}n^3 + \&c.; \text{ and}$$

by means of this general expression, for the increment of x^m , we readily deduce the increment of any function of x , as $x^n + a x^n + b x^n$, &c. Thus, for example, if it were required to find the increment of $x^3 + 3x^2 + 4x$, we have increment of $x^3 = 3x^2n + 3xn^2 + n^3$

$$\begin{aligned} \text{of } 3x^2 &= 6xn + 3n^2 \\ \text{of } 4x &= 4n \end{aligned}$$

Hence the increment of $x^3 + 3x^2 + 4x = 3x^2n + x(3n^2 + 6n) + n^3 + 3n^2 + 4n$.

It is therefore not necessary, when we proceed thus, that the proposed function should be made up of factors in arithmetical progression, as in the former rule.

Again, the increment $\frac{1}{x}$ is the difference between $\frac{1}{x}$ and

$$\frac{1}{x + n} = -\frac{n}{x(x + n)}; \text{ and in the same way we find the}$$

$$\text{increment of } \frac{1}{x(x + n)} = -\frac{2n}{x(x + n)(x + 2n)}; \text{ of}$$

$$\frac{1}{x(x + n)(x + 2n)} = -\frac{3n}{x(x + n)(x + 2n)(x + 3n)};$$

and generally the increment of

$$\frac{1}{x(x + n)(x + 2n) \dots (x + rn)} = -\frac{(r + 1)n}{x(x + n)(x + 2n) \dots (x + r + 1n)}.$$

And hence, again, conversely, the integral of

$$\begin{aligned} &-\frac{(r + 1)n}{x(x + n)(x + 2n) \dots (x + r + 1n)} \\ &= +\frac{1}{x(x + n)(x + 2n) \dots (x + rn)}. \text{ Or, more} \end{aligned}$$

$$\text{generally, the integral of } \frac{1}{x(x + n)(x + 2n) \dots (x + rn)} = -\frac{1}{rn x(x + n)(x + 2n) \dots (x + r - 1n)}.$$

This, as was before observed, is not the most general mode of considering the subject, but we are much mistaken if it be not the most obvious and natural; and therefore the best adapted for illustration, and for conveying to a beginner the first ideas of the theory. We will now shew the application of the above principles to an example or two, by way of elucidation, and then proceed to a more general and extended investigation of the method of increments, and its application to mathematical problems.

Ex. 1.—Let it be proposed to find the sum of 100 terms of the series

$$1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + 4 \cdot 5 \dots \dots \dots 100 \cdot 101.$$

Each of these terms is of the form $x(x + 1)$, and it is obvious that the next term to $100 \cdot 101$, that is $101 \cdot 102$, is the increment of the series; or, making $100 = x$, the last term is $x(x + 1)$, and the succeeding one is $(x + 1)(x + 2)$; which is evidently the increment of the series, or the difference between the proposed series in the first case, and what it becomes when x is increased by the common difference 1; and therefore conversely, the integral of this increment, that is, of $(x + 1)(x + 2)$, will be the sum of the

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the series sought. Now the integral of $(x + 1)(x + 2)$
 $= \frac{x(x + 1)(x + 2)}{3}$; and since x in the present ex-

ample $= 100$, we have $\frac{100 \times 101 \times 102}{3} = 343400$ for
the sum required.

Ex. 2.—Required the sum of n terms of the series
 $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 + \&c. n(n + 1)(n + 2)$.

Here, by writing x instead of $n + 1$, we shall have for
the succeeding term $x(x + 1)(x + 2)$, which is the in-
crement of the series, and therefore the integral of

$x(x + 1)(x + 2) = \frac{(x - 1)x(x + 1)(x + 2)}{4}$ will

be the sum required; which, by re-establishing the value of

$x = n + 1$, becomes $\frac{n(n + 1)(n + 2)(n + 3)}{4} =$ the
sum of n terms.

Ex. 3.—Required the sum of n terms of the natural
series of squares $1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2$.

Here writing x for n , the succeeding term is $(x + 1)^2$
 $= x^2 + 2x + 1 = x(x + 1) + (x + 1)$, which is the
increment; and it consists of two parts. Now the

integral of $x(x + 1) = \frac{(x + 1)x(x + 1)}{3}$;

integral of $x + 1 = \frac{x(x + 1)}{2}$.

And therefore since $x = n$, we have $\frac{n(n + 1)}{2} +$

$\frac{(n - 1)n(n + 1)}{3} =$ the sum required.

Ex.—Let it now be proposed to find the sum of the infinite
series $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \&c.$

Here it will be necessary for us to consider the series as
generated from the extreme term, which is 0, and therefore

$\frac{1}{1 \cdot 2}$ as its last term, which will therefore be the increment

of the series $\frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \&c.$; and, conse-

quently, the integral of this will be the sum of the series,
wanting only the term $\frac{1}{1 \cdot 2}$. Make, therefore, $x = 2$, or

$\frac{1}{2 \cdot 3} = \frac{1}{x(x + 1)}$; in which case the increment $\frac{1}{1 \cdot 2}$ be-

comes $\frac{1}{(x - 1)x}$, and the integral of this $= \frac{1}{x}$ (because

the increment is -1); therefore the sum of the series, be-
ginning at the term $\frac{1}{2 \cdot 3}$, is $\frac{1}{2}$, to which adding the first

term $\frac{1}{1 \cdot 2} = \frac{1}{2}$, we have the sum of the whole series $= 1$.

This will serve to explain the method pursued by M. Ni-
chole in his first paper, and will be useful as an introduction
to what follows: in which we shall not limit ourselves to con-
sidering the continual increase of x as constant as is done
above; but as being variable like x itself; for it is under

this form, that the theory of increments becomes so universally
applicable to almost every species of mathematical investiga-

Notation and Definitions.

1. As the increment of a variable quantity x is nothing
more than the difference between that quantity in its first
state, and what it becomes after a certain increase, this dif-
ference may be properly represented by Dx , or Δx ; and
in the same manner, if y be any function of a variable quan-
tity, Dy , or Δy , will represent the increment of y . And
as in the fluxional or differential calculus, f is made the cha-
racter of integration, so in the present instance, we shall em-
ploy it to represent the integral of any increment.

2. The increment of a variable quantity being, as we have
observed above, only the excess of this quantity in one state,
over the same quantity in the consecutive state, it follows
that if a variable magnitude x become successively $x, x', x'',$
 $x''', \&c.$ we shall have $\Delta x = x' - x$; $\Delta x' = x'' - x'$;
 $\Delta x'' = x''' - x''$; $\Delta x''' = x^{(4)} - x'''$, &c.

It may happen that an increment may be positive, or ne-
gative, according as the variable quantity of which it is the
increment is augmented or diminished, with regard to some
other magnitude or magnitudes which we suppose to in-
crease, and of which the increments are therefore necessarily
positive.

3. The increments of quantities being themselves quan-
tities, if they be variable, we may take the increments of
them, these are called *second increments*; and if these second
increments be also variable, we may in like manner take the
increments of these also; which are called *third increments*, and
so on as long as the differences or increments are variable.

In all these cases, the condition of the increments being
variable, is necessary; because if, in any case, they become
constant, then it is obvious that the increments are 0,
whether it be the first, second, third, &c. increment that
thus become constant or invariable.

Thus the series of squares 1, 4, 9, 16, 25, &c. is an ex-
ample of a case in which the second differences or increments
are constant: for this series may be considered as generated by
a variable quantity x^2 ; which is such, that if the difference
between the successive terms be taken, they will form a series
of quantities in arithmetical progression, and consequently
the differences of these differences, or the second increment
of x^2 will be constant. In the same manner we find the
third differences of the series of cubes, 1, 8, 27, 64, 125, or
the third increment of x^3 , is constant; and therefore the
fourth increment $= 0$; for after any order of increments
becomes constant, all the ulterior orders must, necessarily,
become zero.

4. As Δx denotes the first increment of any variable
quantity x ; so $\Delta^2 x, \Delta^3 x, \Delta^4 x$, &c. will represent the se-
cond, third, fourth, &c. increments of the same quantity x ;
which expressions are sufficiently distinct from $\Delta x^2, \Delta x^3,$
 Δx^4 , &c. which represent the powers of those increments;
and if it be required to express the power of any increment
past the first, as for instance the n th power of the second,
third, &c. increment of x , that will be done thus, $\Delta^2 x^n,$
 $\Delta^3 x^n$, &c.

5. In some problems it is necessary to consider a certain
order of the increments as constant; thus, in any arith-
metical progression the first increments are constant. In
the series of natural squares, the second increments are
necessarily constant; as are also the third increments of
cubes, &c. as we have seen above. But there is an in-

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finite number of questions, in which, from their nature, it is not necessary that any order of their increments should be constant: yet as we may attribute to a certain quantity whatever variation we please, providing that the variations of the other quantities depending upon the first be such as to accord with the variation we have attributed to it; it follows, that in any problem, we may at pleasure make any order of increments of a quantity chosen at will be constant; observing only, that the other quantities ought to vary in consequence; and, therefore, we cannot make another order of increments also constant, unless, from the nature of the problem, some other increment has a certain ratio to that which is so assumed.

6. The whole of the method of increments consists of two problems; viz. 1st. Finding the increments of all orders of any variable quantity, raised to any power; the product of different variable quantities; and generally of any function of variable quantities; which problem is always solvable, and presents but little difficulty in any case; and this is called the *Direct Method of Increments*. The other problem, which is the reverse of the preceding, is that of finding the integral of any given increment, which is frequently insoluble; at least, without infinite series, or some other mode of approximation; and this is termed the *Inverse Method of Increments*: which two problems we will consider under their distinct heads.

Of the Direct Method of Increments.

7. Since the increment of a variable quantity is the difference between the sums in any two consecutive states, it is obvious in general, that in order to find the increment of any function of variable quantities, we must suppose, that each of those quantities is increased or diminished by their respective increments; and substitute these quantities, thus changed, into the proposed function; and from this result, if there be subtracted the original expression, the remainder will be the increment sought.

Ex. 1.—Find the first increment of the sum $x + y + z$. These quantities, augmented by their respective increments, become

$$(x + \Delta x) + (y + \Delta y) + (z + \Delta z)$$

from which subtracting the original expression, there remains $\Delta x + \Delta y + \Delta z$, as is evident; since the whole increment must necessarily be equal to the sum of each particular one.

In the same manner we find the increment of $x + y - z$, or $\Delta(x + y - z) = \Delta x + \Delta y - \Delta z$.

And if we had to find the increment of $a + x + y - z$, we should have, considering a as a constant quantity,

$$\Delta(a + x + y - z) = \Delta x + \Delta y - \Delta z,$$

the same result as before, because the constant quantity a has no increment, or its increment is equal to zero.

Hence it appears, that if to the sum of any variable quantity we add or subtract any constant quantity whatever, the increment of the whole function will still be the same.

Ex. 2. Find the first increment of x^m .

This is, from what is observed above, the difference between $(x + \Delta x)^m$ and x^m ; which by the binomial theorem becomes $m x^{m-1} \Delta x + \frac{m(m-1)}{1 \cdot 2} x^{m-2} \Delta x^2 +$

$\frac{m(m-1)(m-2)}{1 \cdot 2 \cdot 3} x^{m-3} \Delta x^3 + \&c. \Delta x^m$. Thus we find

the increment of x^3 , or

$$\Delta(x^3) = 3x^2 \Delta x + 3x \Delta x^2 + \Delta x^3$$

$$\Delta(x^2) = 2x \Delta x + \Delta x^2$$

$$\Delta(x) = \Delta x$$

&c. &c. &c. &c.

And if the proposed quantity, of which the increment is required, be ax^m , a being a constant multiplier, then it is obvious that

$$\Delta(ax^m) = \begin{cases} a(x + \Delta x)^m - ax^m = \\ a[(x + \Delta x)^m - x^m] = a \Delta(x^m) \end{cases}$$

whence the increment ax^m is equal to a times, the increment of x^m .

Ex. 3. To find the first increment of the product xy .

Here x becomes $x + \Delta x$
and y becomes $y + \Delta y$

whence the product $= xy + y \Delta x + x \Delta y + \Delta x \Delta y$; from which, subtracting the original quantity xy , we have $\Delta(xy) = y \Delta x + x \Delta y + \Delta x \Delta y$.

And in the same way we find

$$\Delta(xyz) = \begin{cases} yz \Delta x + xz \Delta y + xy \Delta z + x \Delta y \Delta z \\ + y \Delta x \Delta z + z \Delta x \Delta y + \Delta x \Delta y \Delta z. \end{cases}$$

And in like manner may the increment of any other product be readily ascertained.

If the product was axy , $axyz$, &c., a being a constant quantity, we should have

$$\Delta(axy) = a \Delta(xy), \Delta(axyz) = a \Delta(xyz), \&c.$$

that is, we must find the increment as above, and multiply the result by the constant factor a .

Ex. 4.—To find the first increment of any quantity of the form $x(x+a)(x+2a)(x+3a)\dots(x+ra)$. It is obvious that this may be referred to the preceding example, by making $x+a=u$; $x+2a=y$; $x+3a=z$; &c. under which substitution, the function, of which the increment is required, reduces to xyz , &c. and, consequently, $\Delta(xyz)$ may be found as above. But if, without this substitution, we find the actual product, it is obvious that it will take the following form (where A, B, C, D , &c. represent constant quantities); viz.

$$x^n + Ax^{n-1} + Bx^{n-2} + Cx^{n-3} + Dx^{n-4} + \&c.$$

and hence by finding the increments of each of those terms by example 2, the sum of them will be the increment of the function proposed. Thus,

$$\Delta(x(x+a)) = \Delta(x^2 + ax).$$

$$\text{Now } \Delta(x^2) = 2x \Delta x + \Delta x^2,$$

$$\Delta(ax) = a \Delta x = a \Delta x;$$

$$\text{whence } \Delta(x(x+a)) = (2x+a) \Delta x + \Delta x^2.$$

And in the same manner

$$\Delta(x(x+a)(x+2a)) = \Delta(x^3 + 3ax^2 + 2a^2x).$$

$$\text{Now } \Delta(x^3) = 3x^2 \Delta x + 3x \Delta x^2 + \Delta x^3$$

$$\Delta(3ax^2) = 6ax \Delta x + 3a \Delta x^2$$

$$\Delta(2a^2x) = 2a^2 \Delta x.$$

The sum of which particular increments will be the increment of the original function proposed: and in exactly the same way, the increment of any similar function may be ascertained.

Ex. 5.—To find the first increment of the fraction $\frac{x}{y}$.

Here

INCREMENTS.

Here we have

$$\Delta \left(\frac{x}{y} \right) = \frac{\frac{x + \Delta x}{y + \Delta y} - \frac{x}{y}}{(y \Delta x - x \Delta y) (y^2 + y \Delta y)^{-1}} = \frac{y \Delta x - x \Delta y}{y^2 + y \Delta y}$$

And therefore from the expansion of $(y^2 + y \Delta y)^{-1}$ into a series, we have

$$\Delta \left(\frac{x}{y} \right) = \frac{(y \Delta x - x \Delta y)}{y^2} \times \left(1 - \frac{\Delta y}{y} + \frac{\Delta y^2}{y^2} + \frac{\Delta y^3}{y^3} + \&c. \right)$$

And if the proposed fraction be effected with any constant factor a , the whole of the above increment must be multiplied by a .

Ex. 6.—To find the first increment of the quantity $\sqrt{(a^2 + x^2)}$.

Here it is obvious, on the same principles, that

$$\Delta (\sqrt{(a^2 + x^2)}) = \sqrt{(a^2 + (x + \Delta x)^2)} - \sqrt{(a^2 + x^2)}$$

$$\sqrt{(a^2 + x^2) + (2x \Delta x + \Delta x^2)} - \sqrt{(a^2 + x^2)}$$

And if now we consider these two expressions as two binomials, to be raised to the power $\frac{1}{2}$, it is obvious that from the development of the first, there will be cancelled the first term, and the other terms will represent the increment required; and thus we have

$$\Delta \sqrt{(a^2 + x^2)} = \frac{2x \Delta x + \Delta x^2}{2(a^2 + x^2)^{\frac{1}{2}}} - \frac{(2x \Delta x + \Delta x^2)^2}{8(a^2 + x^2)^{\frac{3}{2}}} + \frac{(2x \Delta x + \Delta x^2)^3}{16(a^2 + x^2)^{\frac{5}{2}}} - \&c.$$

Ex. 7.—Having given the equation $y^2 - ax + x^2 = 0$ which expresses the relation between the constant quantity a , and the two variable quantities x and y ; to find the equation which ought to express the relation between a , and the first increments of x and y .

Here we must substitute $x + \Delta x$ for x ; and $y + \Delta y$ for y ; which gives

$$(y + \Delta y)^2 - a(x + \Delta x) + (x + \Delta x)^2 = 0;$$

from which, subtracting the original equation, there remains

$$2y \Delta y - a \Delta x + 2x \Delta x + \Delta x^2 + \Delta y^2 = 0,$$

which is the equation required.

And in a similar manner the first increments of any quantities whatever may be ascertained, as also of any algebraical equation.

When it is required to find the second, third, &c. increments of any proposed function, it is only necessary to consider the preceding order of increments as variable quantities; and we shall thus pass from the first increments to the second, from the second to the third, from the third to the fourth, &c.; in the same manner as we pass from the original function to the first increment.

Ex. 1.—To find the second increment of x^2 .

Here we have, in the first place,

$$\Delta (x^2) = 2x \Delta x + \Delta x^2 \text{ the first increment.}$$

And if now, in this expression, we substitute $x + \Delta x$ for x , and $\Delta x + \Delta^2 x$ for Δx , we have

$$\Delta^2 (x^2) = \Delta (2x \Delta x + \Delta x^2) = 2(x + \Delta x) (\Delta x + \Delta^2 x) + (\Delta x + \Delta^2 x)^2 - (2x \Delta x + \Delta x^2)$$

$$= 2\Delta x^2 + 4\Delta x \Delta^2 x + 2x \Delta^2 x + \Delta^2 x^2,$$

which is the second increment required.

And in the same way we find the third, fourth, &c. increments of a quantity or function, by substituting $\Delta^2 x + \Delta^3 x$ instead of $\Delta^2 x$; and $\Delta^3 x + \Delta^4 x$ instead of $\Delta^3 x$; and so on.

Remark.—If we consider the second increments as being constant, it adds very much to the simplicity of the operation; for, after having found the first increments, viz.

$$\Delta (x^2) = 2x \Delta x + \Delta x^2,$$

$$\Delta (x^3) = 3x^2 \Delta x + 3x \Delta x^2 + \Delta x^3,$$

$$\Delta (x^4) = 4x^3 \Delta x + 6x^2 \Delta x^2 + 4x \Delta x^3 + \Delta x^4,$$

$$\&c. \&c.$$

$$\&c. \&c.$$

we shall have for the higher order of increments,

$$\Delta^2 (x^2) = 2 \Delta x^2, \Delta^3 x^2 = 0, \Delta^4 (x^3) = 0, \&c.$$

$$\Delta^2 (x^3) = 6x \Delta x^2 + 6 \Delta x^3, \Delta^2 (x^4) = 6 \Delta x^4,$$

$$\Delta^4 (x^4) = 0, \Delta^5 (x^4) = 0, \&c.$$

$$\Delta^2 (x^4) = 12x^2 \Delta x^2 + 24x \Delta x^3 + 14 \Delta x^4,$$

$$\Delta^3 (x^4) = 24x \Delta x^3 + 36 \Delta x^4, \Delta^4 (x^4) = 24 \Delta x^4,$$

$$\Delta^5 (x^4) = 0, \Delta^6 (x^4) = 0, \&c.$$

$$\&c. \&c. \&c.$$

Scholium.—It is easy to find, on the same principles, the second increments of all sorts of functions. For example, to find the second increment of the product xy , without supposing any increment as constant, we must first find the first increment, which is,

$$\Delta (xy) = y \Delta x + x \Delta y + \Delta x \Delta y.$$

And substituting now in this expression,

$$x + \Delta x \text{ for } x, \text{ and } y + \Delta y \text{ for } y;$$

$$\Delta x + \Delta^2 x \text{ for } \Delta x, \text{ and } \Delta y + \Delta^2 y \text{ for } \Delta y,$$

it becomes

$$(y + \Delta y) (\Delta x + \Delta^2 x) + (x + \Delta x) (\Delta y + \Delta^2 y) + (\Delta y + \Delta^2 y) + (\Delta x + \Delta^2 x) (\Delta y + \Delta^2 y);$$

from which, subtracting the first increment, there remains

$$\Delta^2 (xy) = y \Delta^2 x + x \Delta^2 y + 2 \Delta x \Delta y$$

$$+ 2 \Delta y \Delta^2 x + 2 \Delta x \Delta^2 y + \Delta^2 x \Delta^2 y.$$

And if we suppose Δx constant, this expression reduces to

$$\Delta^2 (xy) = x \Delta^2 y + 2 \Delta x \Delta y + 2 \Delta x \Delta^2 y.$$

And similar methods apply in all cases; it will, therefore, be unnecessary to give any farther examples, except in the case of an exponential expression, which is somewhat different.

Let it be proposed, for example, to find the increment of the hyperbolic logarithm of x .

Let $y = h.l.x$; then, as x becomes $x + \Delta x$; so will y become $y + \Delta y$, that is,

$$y + \Delta y = h.l.(x + \Delta x);$$

and hence, since $y = h.l.x$, we have

$$y + \Delta y - y = h.l.(x + \Delta x) - h.l.x, \text{ or}$$

$$\Delta y = h.l.(x + \Delta x) - h.l.x = h.l.\left(1 + \frac{\Delta x}{x}\right).$$

Now, by the well-known logarithmic series, we have

$$h.l.\left(1 + \frac{\Delta x}{x}\right) = \frac{\Delta x}{x} - \frac{\Delta x^2}{2x^2} + \frac{\Delta x^3}{3x^3} - \frac{\Delta x^4}{4x^4} + \&c.$$

$$\text{whence } \Delta y = \Delta (h.l.x) = \frac{\Delta x}{x} - \frac{\Delta x^2}{2x^2} + \frac{\Delta x^3}{3x^3} - \frac{\Delta x^4}{4x^4}$$

+ &c. as required. And the higher order of increments of $h.l.x$ will be found as above, by taking the increments of the terms of this series.

Ex. 2.—Required the first increment of the exponential expression a^x .

Make $y = a^x$; then, when x becomes $x + \Delta x$, y will become $y + \Delta y$; whence

$$y + \Delta y = a^{x + \Delta x} = a^x \times a^{\Delta x}; \text{ but}$$

$$y = a^x = a^x;$$

$$\text{whence } \Delta y = a^x \times a^{\Delta x} - a^x = a^x (a^{\Delta x} - 1).$$

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Now, expanding $(a^{\Delta x} - 1)$ into a series, we have

$$(a^{\Delta x} - 1) = 1 + \frac{\Delta x (l \cdot a)}{1} + \frac{\Delta x^2 (l \cdot a)^2}{1 \cdot 2} + \frac{\Delta x^3 (l \cdot a)^3}{1 \cdot 2 \cdot 3} + \&c.$$

Therefore Δy , or $\Delta (a^x) =$

$$a^x \times \left\{ \frac{\Delta (l a)}{1} + \frac{\Delta x^2 (l \cdot a)^2}{1 \cdot 2} + \frac{\Delta x^3 (l \cdot a)^3}{1 \cdot 2 \cdot 3} + \&c. \right\}$$

as required. And the higher order of its increments may be found by the usual method.

Of the Inverse Method of Increments.

8. In the inverse method of increments, the question is to find the integral, or function, from its increment being given. We must, therefore, examine with attention the steps by which we descend from a variable quantity to its increment; and then, by the reverse operation, we may ascend to the integral, when the increment is known. But this reverse operation is attended with the very same difficulties as the inverse method of fluxions, for, as in that, every fluent may be readily put into fluxions, so may the increment of any function be readily obtained; but it is frequently difficult, and sometimes impossible to find the fluent of a given fluxion; and so in the method of increments, there are many cases that will not admit of integration; we shall, however, give some of the most usual and obvious rules, and which will apply to the generality of examples.

Let us first attend to the powers of a variable quantity x .

1. Since $\Delta x = \Delta (x)$; therefore, reciprocally, $\int \Delta x = x$. And if we suppose Δx as constant (a supposition that has place in all that follows), we shall have $\int \Delta x \times 1 = x$, or $\Delta x \int 1 = x$; therefore $\int 1 = \frac{x}{\Delta x}$.

2. Since $\Delta (x^2) = 2x \Delta x + \Delta x^2$, therefore, reciprocally, $\int (2x \Delta x + \Delta x^2) = x^2$; or, which is the same, $\int 2x \Delta x + \int \Delta x^2 = x^2$; whence again also $\int x + \int \frac{\Delta x}{2} = \frac{x^2}{2 \Delta x}$; and hence, by transposition, $\int x = \frac{x^2}{2 \Delta x} - \int \frac{\Delta x}{2} = \frac{x^2}{2 \Delta x} - \frac{\Delta x}{2} \times \int 1 = \frac{x^2}{2 \Delta x} - \frac{x}{2}$.

3. Again, since $\Delta (x^3) = 3x^2 \Delta x + 3x \Delta x^2 + \Delta x^3$; therefore, reciprocally,

$\int (3x^2 \Delta x + 3x \Delta x^2 + \Delta x^3) = x^3$; or, which is the same, $\int 3x^2 \Delta x + \int 3x \Delta x^2 + \int \Delta x^3 = x^3$; or dividing by $3 \Delta x$

$\int x^2 + \Delta x \int x + \frac{\Delta x^2}{3} \cdot \int 1 = \frac{x^3}{3 \Delta x}$; whence, again,

$\int x^2 = \frac{x^3}{3 \Delta x} - \Delta x \int x - \frac{\Delta x^2}{3} \cdot \int 1$; or, which is the same,

$$\int x^2 = \frac{x^3}{3 \Delta x} - \frac{x^2}{2} + \frac{x \Delta x}{6}.$$

We find in a similar manner, by continuing to suppose Δx as constant, and substituting always for the quantities contained under the particular sum their respective values; the following results for the integrals of the successive powers of x ; in which we have repeated the two preceding ones, for the sake of uniformity.

$$\int 1 = \frac{x}{\Delta x};$$

$$\int \Delta x = \frac{x^2}{2 \Delta x} - \frac{x}{2};$$

$$\int \Delta x^2 = \frac{x^3}{3 \Delta x} - \frac{x^2}{2} + \frac{x \Delta x}{6};$$

$$\int \Delta x^3 = \frac{x^4}{4 \Delta x} - \frac{x^3}{2} + \frac{x^2 \Delta x}{4};$$

$$\int \Delta x^4 = \frac{x^5}{5 \Delta x} - \frac{x^4}{2} + \frac{x^3 \Delta x}{3} - \frac{x^2 \Delta x^2}{12};$$

$$\int \Delta x^5 = \frac{x^6}{6 \Delta x} - \frac{x^5}{2} + \frac{5x^4 \Delta x}{12} - \frac{x^3 \Delta x^2}{12};$$

&c. &c.

&c. &c.

where it is only necessary to observe, that if the proposed increment have any constant multiplier, the integral above found must have the same.

Cor. 1.—Hence we may find the integral of any function composed of the powers of x , affected with any constant coefficients a, b, c , &c. For in order to find the integral of such an increment, it is only necessary to find those of the different powers of x , and their sum will be the integral required.

Ex. 1.—Required the integral of the increment $a + bx + cx^2$; considering Δx as constant.

$$\int a = a \int 1 = \frac{a x}{\Delta x}$$

$$\int b x = b \int x = \frac{b x^2}{2 \Delta x} - \frac{b x}{2}$$

$$\int c x^2 = c \int x^2 = \frac{c x^3}{3 \Delta x} - \frac{c x^2}{2} + \frac{c x \Delta x}{6}$$

And hence by addition,

$$\int (a + b x + c x^2) = \frac{a x}{\Delta x} + \frac{b x^2}{2 \Delta x} - \frac{b x}{2} + \frac{c x^3}{3 \Delta x} - \frac{c x^2}{2} + \frac{c x \Delta x}{6}.$$

Ex. 2.—Required the integral of $a x^4 - b x^2$, considering Δx as constant.

Here we have

$$\int a x^4 = \frac{a x^5}{5 \Delta x} - \frac{a x^4}{2} + \frac{a x^3 \Delta x}{3} - \frac{a x^2 \Delta x^2}{30}$$

$$\int -b x^2 = -\frac{b x^3}{3 \Delta x} + \frac{b x^2}{2} - \frac{b x \Delta x}{6}$$

the sum of which expressions will be the whole increment sought.

Cor. 2.—When it is required to find the integral of a quantity of any of the following forms, (Δx being supposed constant,) viz.

$$\begin{aligned} &(x+a) \\ &(x+a)(x+2a) \\ &(x+a)(x+2a)(x+3a) \\ &(x+a)(x+2a)(x+3a)(x+4a) \end{aligned}$$

we arrive at them by taking the actual product of those quantities, and finding successively the increments of each of the terms: thus,

$$1. \int (x+a) = \int x + \int a = \frac{x^2}{2 \Delta x} - \frac{x}{2} + \frac{a x}{\Delta x}$$

$$2. \int (x+a)(x+2a) = \int (x^2 + 3ax + 2a^2) =$$

$$\int x^2$$

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$$\begin{cases} \int x^3 = \frac{x^4}{4\Delta x} - \frac{x^3}{3} + \frac{x^2\Delta x}{2} \\ \int 3ax^2 = \frac{3ax^3}{3\Delta x} - \frac{3ax^2}{2} \\ \int 2a^2x = \frac{2a^2x^2}{2\Delta x} \end{cases}$$

$$\text{Whence } \int (x+a)(x+2a) = \frac{x^3}{3\Delta x} - \frac{x^2}{2} + \frac{x\Delta x}{6} + \frac{3ax^2}{2\Delta x} - \frac{3ax}{2} + \frac{2a^2x}{\Delta x}.$$

$$\begin{aligned} 3. \text{ Again, } \int (x+a)(x+2a)(x+3a) &= \\ \int (x^3 + 6ax^2 + 11a^2x + 6a^3) &= \\ \begin{cases} \int x^3 = \frac{x^4}{4\Delta x} - \frac{x^3}{3} + \frac{x^2\Delta x}{2} \\ \int 6ax^2 = \frac{3a}{\Delta x}x^3 - \frac{3ax^2}{2} + \frac{3a^2x\Delta x}{6} \\ \int 11a^2x = \frac{11a^2x^2}{2\Delta x} - \frac{11a^2x}{2} \\ \int 6a^3 = \frac{6a^3x}{\Delta x} \end{cases} \end{aligned}$$

$$\text{Whence by addition, we have } \int (x+a)(x+2a)(x+3a) = \frac{x^4}{4\Delta x} - \frac{x^3}{3} + \frac{x^2\Delta x}{2} + \frac{2ax^3}{\Delta x} - \frac{3ax^2}{2} + \frac{ax\Delta x}{1} + \frac{11a^2x^2}{2\Delta x} + \frac{6a^3x}{\Delta x} - \frac{11a^2x}{2} + \frac{6a^3}{\Delta x}; \text{ and so on of}$$

other similar quantities.

And if it be required to find the integral of quantities of the form

$$\begin{aligned} &x(x+a) \\ &x(x+a)(x+2a) \\ &x(x+a)(x+2a)(x+3a) \\ &\&c. \&c. \&c. \end{aligned}$$

we have in the same way

$$\begin{aligned} 1. \int x(x+a) &= \int x^2 + \int ax = \frac{x^3}{3\Delta x} - \frac{x^2}{2} + \frac{x\Delta x}{6} + \frac{ax^2}{2\Delta x} - \frac{ax}{2} \\ 2. \int x(x+a)(x+2a) &= \int x^3 + 3a \int x^2 + 2a^2 \int x = \\ \begin{cases} \int x^3 = \frac{x^4}{4\Delta x} - \frac{x^3}{3} + \frac{x^2\Delta x}{2} \\ 3a \int x^2 = \frac{3a}{\Delta x}x^3 - \frac{3ax^2}{2} + \frac{3a^2x\Delta x}{6} \\ 2a^2 \int x = \frac{2a^2x^2}{2\Delta x} - \frac{2a^2x}{2} \end{cases} \end{aligned}$$

the sum of which will be the increment required.

And, in a similar manner, we may find the integral to any other quantity of these forms.

9. *Remark.*—Before we proceed any further on this subject, it will be proper to attend to the correction of any integral, when from the nature of the problem under consideration such becomes necessary.

As the increments of any variable quantities x , and $x+a$, are both expressed by Δx , the constant part a having no increment, so, reciprocally, the integral of the increment Δx may be x , or $x+a$; therefore, when we have found the integral of any increment, we must add to it a constant quantity, which will be zero, if the integral needs no correction

but a real quantity, positive or negative, in other cases, which must be determined from the nature of the problem. This remark will be of considerable importance in what follows.

10. Let us then consider those products, of which the factors are continually increased by a constant difference; viz.

$$\begin{aligned} &x(x+\Delta x) \\ &x(x+\Delta x)(x+2\Delta x) \\ &x(x+\Delta x)(x+2\Delta x)(x+3\Delta x) \\ &\&c. \&c. \&c. \end{aligned}$$

Here it is obvious that the increment of $x(x+\Delta x)$; or $1\Delta(x(x+\Delta x)) = (x+\Delta x)(x+2\Delta x) - x(x+\Delta x)$; whence, by multiplication and subtraction, we have

$$\Delta(x(x+\Delta x)) = 2\Delta x(x+\Delta x).$$

In the same manner we find,

$$\Delta(x(x+\Delta x)(x+2\Delta x)) = 3\Delta x(x+\Delta x)(x+2\Delta x);$$

And thus again,

$$\Delta(x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)) = 4\Delta x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)$$

and so on of other similar products. Whence it appears, that in order to find the increment of any product of the above form, we must suppress the first factor x , and write in its place the increment Δx , effected with a co-efficient equal to the total number of factors; all the other part of the expression remaining as before.

Whence again, conversely, the integral to any increment of this form, will be found from the reverse operation.

Thus for example,

$$1. \int 2\Delta x(x+\Delta x) = x(x+\Delta x)$$

$$2. \int 3\Delta x(x+\Delta x)(x+2\Delta x) = x(x+\Delta x)(x+2\Delta x)$$

$$3. \int 4\Delta x(x+\Delta x)(x+2\Delta x)(x+3\Delta x) = x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)$$

and so on of others.

Whence, in order to find the corresponding integral to any increment of the above form, which may be represented generally by

$$\begin{aligned} &a\Delta x(x+\Delta x)(x+2\Delta x)\dots(x+n\Delta x), \\ &\text{we must change } \Delta x \text{ in the first factor into } x, \text{ and divide the} \\ &\text{whole by the number of factors; that is,} \\ &\frac{\int a\Delta x(x+\Delta x)(x+2\Delta x)\dots(x+n\Delta x)}{n+1} = \\ &\frac{ax(x+\Delta x)(x+2\Delta x)\dots(x+n\Delta x)}{n+1}. \end{aligned}$$

This part of the theory has been before considered in the preceding pages, in describing the method employed by M. Nichole of the Academy of Sciences, published in 1717.

11. Let us now consider those fractions, the denominators of which are composed of factors similar to those above described, viz.

$$\begin{aligned} &\frac{1}{x(x+\Delta x)} \\ &\frac{1}{x(x+\Delta x)(x+2\Delta x)} \\ &\frac{1}{x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)}; \&c. \end{aligned}$$

in which Δx is constant.

Here,

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Here, by taking the differences as before, we shall have

$$1. \Delta \left\{ \frac{1}{x(x+\Delta x)} \right\} = \frac{1}{(x+\Delta x)(x+2\Delta x)} - \frac{1}{x(x+\Delta x)} \\ = -2\Delta x \times \frac{1}{x(x+\Delta x)(x+2\Delta x)}.$$

And in the same manner we find the increment, or,

$$2. \Delta \left\{ \frac{1}{x(x+\Delta x)(x+2\Delta x)} \right\} = -3\Delta x \\ \times \frac{1}{x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)}$$

$$3. \Delta \left\{ \frac{1}{x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)} \right\} = - \\ 4\Delta x \times \frac{1}{x(x+\Delta x)(x+2\Delta x)(x+3\Delta x)(x+4\Delta x)}$$

and so on of others. Whence it follows, that in order to determine the increment of any expressions of the above form, we must increase the denominator by one factor, and multiply the new fraction by the constant increment taken negatively and affected by such a co-efficient, as is equal to the number of factors in the denominator of the resulting fraction.

And hence, again, conversely, in order to find the integral corresponding to any increment of the form

$$\frac{a\Delta x}{x(x+\Delta x)(x+2\Delta x)(x+3\Delta x) \dots (x+n\Delta x)}$$

we must suppress the last factor in the denominator, and afterwards divide the resulting fraction, taken negatively, by the product of Δx , into the number of factors comprised in the denominator of the said fraction; thus,

$$\int \frac{a\Delta x}{x(x+\Delta x)(x+2\Delta x)(x+3\Delta x) \dots (x+n\Delta x)} \\ = \frac{-a}{n x(x+\Delta x)(x+2\Delta x)(x+3\Delta x) \dots (x+n-1\Delta x)}$$

12. On the same principles we find

$$\Delta \left(\frac{1}{x+n\Delta x} \right) = \frac{1}{x+(n+1)\Delta x} - \frac{1}{x+n\Delta x}$$

and, therefore, reciprocally,

$$\int \frac{1}{x+(n+1)\Delta x} - \int \frac{1}{x+n\Delta x} = \frac{1}{x+n\Delta x} :$$

The integration of these two latter expressions cannot be effected separately, but the difference of them is evidently

$$\text{equal to the algebraical fraction } \frac{1}{x+n\Delta x}$$

Whence it appears, that quantities may sometimes admit of integration, by being decomposed into many parts; which, though they will not admit of it in their state of separation, may, notwithstanding, be so combined with each other, that the final result shall be algebraical; a circumstance that commonly happens in practical operations.

Examples of Integration.

13. Ex. 1.—Find the integral of the increment

$$\frac{3x+2\Delta x}{x(x+\Delta x)(x+2\Delta x)}.$$

This quantity admits of the following decomposition:

$$\frac{3x+2\Delta x}{x(x+\Delta x)(x+2\Delta x)} = \frac{1}{\Delta x(x)} + \frac{1}{\Delta x(x+\Delta x)} \\ - \frac{2}{\Delta x(x+2\Delta x)} = \frac{1}{\Delta x} \times \frac{1}{x} + \frac{1}{\Delta x} \times \frac{1}{x+\Delta x} \\ - \frac{2}{\Delta x} \times \frac{1}{x+2\Delta x} : \text{each of which parts is evidently of}$$

the form that has been investigated in the preceding paragraph. By making first $n=0$, $n=1$, and $n=2$; thus we have

$$\int \frac{1}{x} = \int \frac{1}{x+\Delta x} - \frac{1}{x} :$$

by which means the integral of the proposed quantity takes the following form: viz.

$$\frac{2}{\Delta x} \left\{ \int \frac{1}{x+\Delta x} - \int \frac{1}{x+2\Delta x} \right\} - \frac{1}{x\Delta x}.$$

But the above formula gives also

$$\int \frac{1}{x+\Delta x} - \int \frac{1}{x+2\Delta x} = \frac{-1}{x+\Delta x} :$$

whence the whole integral is

$$\frac{1}{\Delta x} \times \left(\frac{-2}{x+\Delta x} - \frac{1}{x} \right) = -\frac{3x-\Delta x}{x\Delta x(x+\Delta x)}$$

as required.

Ex. 2.—Required the integral of the quantity

$$\frac{3\Delta x}{x(x+3\Delta x)}$$

$$\text{Here we have } \frac{3\Delta x}{x(x+3\Delta x)} = \frac{1}{x} - \frac{1}{x+3\Delta x} ;$$

and, consequently, the integral of the quantity will be

$$\int \frac{1}{x} - \int \frac{1}{x+3\Delta x}.$$

Now the above formula gives

$$\int \frac{1}{x} = \int \frac{1}{x+\Delta x} - \frac{1}{x}$$

$$\int \frac{1}{x+3\Delta x} = \frac{1}{x+2\Delta x} + \int \frac{1}{x+2\Delta x} ;$$

whence the whole integral is expressed by

$$\int \frac{1}{x+\Delta x} - \int \frac{1}{x+2\Delta x} - \frac{1}{x} - \frac{1}{x+2\Delta x}.$$

$$\text{But } \int \frac{1}{x+\Delta x} - \int \frac{1}{x+2\Delta x} = \frac{-1}{x+\Delta x}$$

by the same formula, and, consequently, we have at length

$$\int \frac{3\Delta x}{x(x+3\Delta x)} = -\frac{1}{x+2\Delta x} - \frac{1}{x+\Delta x} - \frac{1}{x}.$$

Such are the elements of the direct and inverse method of increments, and which will be found to embrace a very great number of cases; but those who wish for a more complete development of the principles, cannot consult a work better calculated to convey the necessary information, than the third volume of the "Traité du Calcul Différentiel, &c." par La Croix. We shall now conclude this article,

by

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By shewing the application of the foregoing theory a few examples.

Application of the Method of Increments.

14. The summation of series, by the inverse method of increments, is founded generally on this principle; that if we have any series of quantities, as

$$a, b, c, d, e, \&c.$$

which are derived from each other according to some known law; each term may be considered as the increment of the sum of all those which precede it. Thus,

$$\begin{aligned} \text{let } a + b + c + d + e &= z \\ \text{and } a + b + c + d + e + f &= z': \end{aligned}$$

then it is obvious, that $z' - z = \Delta z = f$; and therefore, conversely, the integral of any one of those terms, considered as an increment, will represent the sum of all the preceding part of the series.

This being premised, we may proceed to the solution of the following examples.

Ex. 1. Required the sum of n terms of the natural series

$$1 + 2 + 3 + 4 + 5 + \dots + n$$

Here, by writing x instead of n , the term next in order will be $x + 1$, which being the increment of the series, we shall have $\int (x + 1) =$ the sum required.

Now $\int (x + 1) = \int x + \int 1$; and by art. 8.

$$\int x = \frac{x^2}{2 \Delta x} - \frac{x}{2}; \text{ and } \int 1 = \frac{x}{\Delta x}.$$

And since in this case $\Delta x = 1$, we have

$$\int (x + 1) = \frac{x^2}{2} - \frac{x}{2} + \frac{x}{1} = \frac{x^2 + x}{2} = \frac{n^2 + n}{2}$$

by writing again n instead of x , which is the sum of n terms of the proposed series, as is also evident from other considerations.

Remark.—This example offers an easy illustration of what has been observed at art. 9, of the correction of an integral, which is necessary in many cases, the same as the correction of a fluent is in the fluxional or differential calculus. Suppose for example, that instead of the preceding series beginning at unity, it had commenced from any other term, as 7; the general law of formation would have been the same, and the increment would still have had the form $x + 1$; and consequently the integral, in the first instance, would be represented as above; viz.

$$\int (x + 1) = \frac{x^2 + x}{2}.$$

But here a correction of the integral is necessary, for from the nature of the series, when $x = 7$, the sum of the series is 7, this being the term at which the series commences; whereas, without a correction, we should have the sum = 28; we must, therefore, write

$$\int (x + 1) = \frac{x^2 + x}{2} + c; \text{ } c \text{ being the correction, and}$$

since when $x = 7$, $\frac{x^2 + x}{2} + c = 7$; or $\frac{49 + 7}{2} + c = 7$,

we find $c = -21$; after which the sum of any number of terms of the proposed series is readily obtained. Thus for example, let $n = 16$, then the sum of the series beginning with the term 7 becomes

$$\frac{16 + 16}{2} - 21 = 11; \text{ as required.}$$

Ex. 2.—Find the sum of the series of squares $1^2 + 3^2 + 5^2 + 7^2 + \&c. n^2$.

Here the general term of the series is $(x + 2)^2$, and therefore the sum required will be expressed by the integral of $(x + 2)^2$.

Now $\int (x + 2)^2 = \int x^2 + \int 4x + \int 4$; and by article 8

$$\int x^2 = \frac{x^3}{3 \Delta x} - \frac{x^2}{2} + \frac{x \Delta x}{6}$$

$$4 \int x = \frac{4x^2}{2 \Delta x} - \frac{4x}{2}$$

$$4 \int 1 = \frac{4x}{\Delta x}$$

And since in this case $\Delta x = 2$, we have

$$\begin{aligned} \int (x + 2)^2 &= \frac{x^3}{6} - \frac{x^2}{2} + \frac{2x}{6} + \frac{4x^2}{4} - \frac{4x}{2} + \frac{4x}{2} \\ &= \frac{x^3}{6} + \frac{x^2}{2} + \frac{x}{3} = \frac{n^3}{6} + \frac{n^2}{2} + \frac{n}{3} \end{aligned}$$

by making $x = n$.

But here again, if the series do not begin at unity, it will require a correction, which will be found generally, thus: suppose the series to commence at any term p ; and let $x = p$, then the above formula gives the sum of the series to the

term $p = \frac{p^3}{6} + \frac{p^2}{2} + \frac{p}{3}$, whereas it ought to be p^2 ; the

correction therefore becomes $-\left(\frac{p^3}{6} + \frac{p^2}{2} + \frac{p}{3} - \frac{p^2}{1}\right) = -\left(\frac{p^3}{6} - \frac{p^2}{2} + \frac{p}{3}\right) = c$; and, therefore, the general expres-

sion for any number of terms of this series, between the limits p and n , will be

$$\frac{n^3}{6} + \frac{n^2}{2} + \frac{n}{3} - \frac{p^3}{6} + \frac{p^2}{2} - \frac{p}{3}.$$

Cor.—This example will also furnish the solution of the problem, when the roots of the squares differ from each other by any constant quantity m ; for it will only be necessary to make

$\Delta x = m$, and the same formula will give $\int (x + m)^2 = \int x^2 + 2m \int x + m^2 \int 1$

$$\int x^2 = \frac{x^3}{3 \Delta x} - \frac{x^2}{2} + \frac{x \Delta x}{6}$$

$$2m \int x = \frac{2m x^2}{2 \Delta x} - \frac{2m x}{2}$$

$$m^2 \int 1 = \frac{m^2 x}{\Delta x}$$

And since in this case we have $\Delta x = m$, the sum of these expressions becomes

$$\int (x + m)^2 = \frac{x^3}{3m} + \frac{x^2}{2} + \frac{mx}{6} + c, \text{ the correction; and}$$

therefore the general formula for the sum beginning at any term p , will be

$$\frac{n^3}{3m} + \frac{n^2}{2} + \frac{mn}{6} - \frac{p^3}{3m} + \frac{p^2}{2} - \frac{mp}{6}.$$

Ex. 3.—Required the sum of the natural series of cubes $1^3 + 2^3 + 3^3 + 4^3 + \&c. n^3$.

C

Here

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Here the general term is $(x+1)^3$; and the integral of this, that is, $\int (x+1)^3 = \int x^3 + 3 \int x^2 + 3 \int x + \int 1$, is computed as follows:

$$\begin{aligned}\int x^3 &= \frac{x^4}{4 \Delta x} - \frac{x^3}{2} + \frac{x^2 \Delta x}{4} \\ 3 \int x^2 &= \frac{3x^3}{3 \Delta x} - \frac{3x^2}{2} + \frac{3x \Delta x}{6} \\ 3 \int x &= \frac{3x^2}{2 \Delta x} - \frac{3x}{2} \\ \int 1 &= \frac{x}{\Delta x}\end{aligned}$$

And here, since $\Delta x = 1$, we have

$$\int (x+1)^3 = \frac{x^4}{4} + \frac{x^3}{2} + \frac{x^2}{4} = \left(\frac{x^2 + x}{2} \right)^2$$

Or, by making $x = n$, the sum required is $\left(\frac{n^2 + n}{2} \right)^2$

Hence a very curious property with regard to the sums of consecutive cubes beginning at 1; viz. that this sum is equal to the square of the sum of all their roots.

$$\begin{aligned}\text{Thus, } 1^3 + 2^3 &= (1+2)^2 \\ 1^3 + 2^3 + 3^3 &= (1+2+3)^2 \\ 1^3 + 2^3 + 3^3 + 4^3 &= (1+2+3+4)^2 \\ &\text{\&c.} \qquad \qquad \text{\&c.}\end{aligned}$$

As to the correction in those cases that required it, it will be found as in the preceding example; as also the sums of any number of cubes whose roots are in arithmetical progression, having any common difference m . And the sums of any powers whatever are attainable upon the same principles.

Ex. 4.—Required the sum of any proposed number of terms in the series of triangular numbers

$$1, 3, 6, 10, 15, \&c.$$

In this case the general term is $\frac{x(x+1)}{2}$,

$$\begin{aligned}\text{and it will therefore be necessary to find the integral of} \\ \frac{(x+1)(x+2)}{2} &= \frac{1}{2} \int (x+1)(x+2) \text{ but (art. 10)} \\ &= \frac{1}{2} \int (x+1)(x+2) = \frac{x(x+1)(x+2)}{6 \Delta x} = \\ \frac{x(n+1)(n+2)}{6} &\text{ by making } x = n, \text{ and } \Delta x = 1.\end{aligned}$$

The same may be otherwise found from art. 8; thus,

$$\begin{aligned}\frac{1}{2} \int (x+1)(x+2) &= \frac{1}{2} \int x^2 + \frac{1}{2} \int 3x + \frac{1}{2} \int 2 \\ \frac{1}{2} \int x^2 &= \frac{x^3}{6 \Delta x} - \frac{x^2}{4} + \frac{x \Delta x}{12} \\ \frac{1}{2} \int 3x &= \frac{3x^2}{4 \Delta x} - \frac{3x}{4} \\ \frac{1}{2} \int 2 &= \frac{x}{\Delta x}\end{aligned}$$

And since $\Delta x = 1$, this sum becomes

$$\frac{1}{2} \int (x+1)(x+2) = \frac{x^3}{6} + \frac{x^2}{2} + \frac{x}{3} = \frac{x(x+1)(x+2)}{6}.$$

And the sums of any order of polygonal and figurate numbers may be found in the same manner.

Ex. 5.—Required the sum of any number n terms of the series

$$1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + 4 \cdot 5 + \&c. n(n+1)$$

Here the general term of the series is $x(x+1)$, it is therefore required to find the integral of $(x+1)(x+2)$. First by art. 10. we have

$$\int (x+1)(x+2) = \frac{x(x+1)(x+2)}{3 \Delta x} = \frac{n(n+1)(n+2)}{3} \text{ by writing } x = n, \text{ and } \Delta x = 1.$$

The same may also be found, as in the example above, by article 8; but it is needless to repeat it, as it only differs from that in its constant factor.

We have in neither of the foregoing examples any correction, for it is obvious that when $x = 0$, the formula $\frac{x(x+1)(x+2)}{6} = 0$, as it ought to be, and therefore the integral needs no correction.

Ex. 6.—Required the sum of any number of terms n , of the series

$$1 \cdot 4 \cdot 7 \cdot 10 + 4 \cdot 7 \cdot 10 \cdot 13 + 7 \cdot 10 \cdot 13 \cdot 16 + \&c. n(n+3)(n+6)(n+9).$$

Here the general term of the series is $x(x+3)(x+6)(x+9)$, and we have therefore to find the integral of $(x+3)(x+6)(x+9)(x+12)$. Now, by art. 10.

$$\int (x+3)(x+6)(x+9)(x+12) = \left\{ \begin{aligned} &\frac{x(x+3)(x+6)(x+9)(x+12)}{5 \Delta x} = \\ &\frac{n(n+3)(n+6)(n+9)(n+12)}{15} \end{aligned} \right.$$

by writing $x = n$, and $\Delta x = 3$.

Ex. 7.—Required the sum of the infinite series

$$\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} + \&c.$$

Here the general term of the series is $\frac{1}{x(x+1)(x+2)}$; and the most simple idea is now

to consider the series as generated from its extremity, which is infinitely distant; under which circumstance each term will be the increment of all those which follow it in the above arrangement; and therefore, in order to find the sum beginning at any term $\frac{1}{x(x+1)(x+2)}$, we have

simply to find the integral of $\frac{1}{(x-1)(x)(x+1)}$ taken negatively, because the increment x , that is, $\Delta x = -1$. Now, by art. 11,

$$\int \frac{1}{(x-1)(x)(x+1)} = \frac{1}{\Delta x} \times \frac{-1}{2x(x+1)} = \frac{1}{2x(x+1)}, \text{ because } \Delta x = -1; \text{ that is, the sum of the above infinite series beginning at any term } \frac{1}{n(n+1)(n+2)}$$

is equal to $\frac{1}{2n(n+1)}$; and therefore when $n = 1$, the whole series becomes $= \frac{1}{2}$.

Cor. Having thus found the sum of the whole series, we may readily find the sum of as many terms as we please, for we have seen that the sum beginning at the n th term from the first, is $\frac{1}{2n(n+1)}$; and therefore, beginning at the

$(n+1)$ th term, the sum will be $= \frac{1}{2(n+1)(n+2)}$; which last sum taken from the whole sum $\frac{1}{4}$, will leave that of the first n terms, that is,

$$\text{sum } n \text{ terms} = \frac{1}{4} - \frac{1}{2(n+1)(n+2)} = \frac{(n+1)(n+2) - 2}{4(n+1)(n+2)}$$

Thus, if $n = 1$, sum $= \frac{1}{6}$; if $n = 2$, sum $= \frac{1}{4}$; if $n = 3$, the sum $= \frac{1}{2}$, &c.

Ex. 8.—Find the sum of the infinite series

$$\frac{1}{1.5} + \frac{1}{5.9} + \frac{1}{9.13} + \frac{1}{13.17} + \&c. \frac{1}{n(n+4)}$$

Here the general term of the series being $\frac{1}{x(x+4)}$; we shall, on the same principles as in the preceding example, have to find the integral of $\frac{1}{(x-4)x}$.

Now by art. 11.

$$\int \frac{1}{(x-4)x} = \frac{1}{x} \times \frac{-1}{x} = \frac{1}{4x}; \text{ because } \Delta x = -4.$$

Making, therefore, $x = 1$, we have $\frac{1}{4}$ for the sum of the whole series, beginning at the first term. We might have added here a variety of other examples, had the limits of the article admitted of it, but such as are given will be found to apply in a number of cases; and will indicate to the intelligent reader the method of application in many others, which are reducible to similar principles. It will be proper, however, before we dismiss this subject entirely, to say a few words on the celebrated theorem of Dr. Taylor, the learned author of this theory. This theorem may be expressed as follows:

Let Y represent any function whatever of the variable quantity x ; then if x be increased by any difference Δx , the value Y , that is $Y + \Delta Y$, becomes (adopting the differen-

$$\text{tial notation) } Y + \Delta Y = Y + \frac{\Delta x dY}{1 \cdot dx} + \frac{\Delta x^2 d^2 Y}{1 \cdot 2 \cdot dx^2}$$

$$+ \frac{\Delta x^3 d^3 Y}{1 \cdot 2 \cdot 3 \cdot dx^3} + \frac{\Delta x^4 d^4 Y}{1 \cdot 2 \cdot 3 \cdot 4 \cdot dx^4} \&c. \text{ or, } \Delta Y = \frac{\Delta x dY}{1 \cdot dx} +$$

$$\frac{\Delta x^2 d^2 Y}{1 \cdot 2 \cdot dx^2} + \frac{\Delta x^3 d^3 Y}{1 \cdot 2 \cdot 3 \cdot dx^3} + \frac{\Delta x^4 d^4 Y}{1 \cdot 2 \cdot 3 \cdot 4 \cdot dx^4} + \&c. \text{ where the}$$

law of continuation is obvious, and requires no farther development; it must, however, be remarked, that when Δx is negative, the terms of the above series must be taken plus and minus alternately; and it will therefore be more generally expressed by

$$\pm \Delta Y = \frac{\Delta x dY}{1 \cdot dx} \pm \frac{\Delta x^2 d^2 Y}{1 \cdot 2 \cdot dx^2} + \frac{\Delta x^3 d^3 Y}{1 \cdot 2 \cdot 3 \cdot dx^3} \pm \&c.$$

In order then to find the increment of any function of a variable quantity, we must take the successive order of its fluxions, by which means all the fluxional parts in both the numerator and denominator will disappear; and we shall have the value of ΔY expressed in terms of x and Δx ; and this expression will always be finite, unless the function be transcendental.

Let us propose the function $Y = ax + bx^2 + x^3$ to find the value of Y , when x becomes $x + \Delta x$.

$$\begin{aligned} d. Y &= a dx + 2bx dx + 3x^2 dx \\ d^2 Y &= 2b dx^2 + 6x dx^2 \\ d^3 Y &= 6 dx^3 \\ d^4 Y &= 0 \end{aligned}$$

Now these values being substituted in the general series, we shall have for the increment of Y ,

$$\Delta Y = \Delta x (a + 2bx + 3x^2) + \Delta x^2 (b + 3x) + \Delta x^3$$

Again, given $Y = ax + bx^2 - cx^3 + x^4$, to find the increment of Y .

$$\begin{aligned} d. Y &= a dx + 2bx dx - 3cx^2 dx + 4x^3 dx \\ d^2 Y &= 2b dx^2 - 6cx dx^2 + 12x^2 dx^2 \\ d^3 Y &= -6c dx^3 + 24x dx^3 \\ d^4 Y &= 24 dx^4 \\ d^5 Y &= 0 \end{aligned}$$

Whence making these substitutions in the general theorem, we have

$$\Delta Y = \left\{ \begin{aligned} &\Delta x (a + 2bx - 3cx^2 + 4x^3) + \Delta x^2 (b - 3cx + 6x^2) \\ &+ \Delta x^3 (c + 4x) + \Delta x^4 \end{aligned} \right.$$

These examples will explain the method of applying the theorem to any case that may arise, it being as universal in its application in the theory of increments, or differences; as the binomial theorem is in the expansion of roots and powers; but, like the latter, it was left by its author without demonstration: it has, however, received many since from several able mathematicians, though there is no one of them perhaps that is quite so satisfactory as might be wished; Maclaurin's rests upon the fluxional calculus, which it would be desirable not to introduce, if it could be obtained from more evident and obvious principles. Another demonstration of this theorem, and which is considered the most satisfactory of any that has yet appeared, is given by l'Huilier of Geneva, in his work entitled "Principiorum calculi diff. et integr. expositio elementaris," in 4to. published in 1795.

INCROACHMENT, in *Law*. See **ACCROCHING**.

INCRUSTATION, the lining or coating of a wall, either with glossy stones, rustics, marble, pottery, or stucco-work; and that either equably, or in panels and compartments.

INCRUSTATION, in *Natural History*, is one of the modes in which organic remains are preserved in the earth: the petrifying or incrusting matter, forming so thin a coat or crust around the extraneous fossil, that its external form is nearly preserved on the stony incrustation. Mr. William Martin classes these among the artificial genera of reliquia, and observes, "Outlines," p. 177, note, that "the common calcareous incrustations of our rivers, &c. have been ranked as petrifications; but, with more propriety, may be considered as incipient matrices." If the coat of mineral matter be too thick to exhibit externally the exact figure of the fossil which it covers, such are called by this author sub-incrusting matrices, of which ironstone nodules inclosing leaves of plants, &c. are well-known examples. The petrifying springs of Derbyshire, (for a list of which, see Mr. Farey's Report on that county, vol. i.) and other calcareous districts, are well known for the curious and whimsical incrustations which are there in a short time produced.

INCRUSTED, or **INCRUSTATED Column**. See **Incrustated Column**.

INCUBATION, in *Comparative Anatomy*, is the term applied to the conduct of most birds in sitting or sitting upon their eggs, in order to communicate to them the necessary degree of warmth for the excitement of their internal parts, and the development of the foetus.

The phenomena produced by incubation are so interest-

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ing, on account of their exhibiting in a palpable manner the progress of foetal existence, that they have been studied by almost every respectable physiologist. Writings have been left upon this subject by Aristotle, Hippocrates, Fabricius ab Aquapendente, Aldrovandus, Coiter, Vesling, Harvey, Langley, Schrader, Theod. Aldes, Stenon, Needham, Malpighi, Maitre Jan, Haller, Hunter, Monroe, &c. besides some later observations by Blumenbach, Leveille, and other continental anatomists. Notwithstanding the labours of so many eminent men, some of the most important points in the history of incubation remain still undetermined. The best treatises are those of Malpighi, Maitre Jan, and Haller, but even in these authors there are many errors to correct, and, except some detached figures that have been published to illustrate particular parts of this subject, we do not possess any tolerably good plates.

The deficiency and doubts that still remain, with respect to several parts of the history of incubation, prove how difficult it is to investigate the subject.

The membranes of the egg, and the organs of the chick, are in general so tender, that they do not admit of being easily or satisfactorily examined; and when prepared by immersion in spirits, acids, or other astringent liquors, their natural appearances and connections are much obscured.

The progress in the growth of the membranes is found to be in many circumstances unlike what would be expected, and what it appears to be; and the attachments of the membranes to each other are extremely intricate and perplexing. This part of the anatomy of the incubated egg, therefore, principally requires improvement. In the following article we have endeavoured to supply, by our own observations, what was deficient in the history of incubation, but, we must confess, not with as much success as we could wish; there are several anatomical points upon which we are obliged to speak doubtfully, and we have not been able to satisfy ourselves respecting the uses attributed to some of the parts of the incubated egg, although we believe others will be found to be elucidated by the experiments we have made, and which are here related.

Most writers upon incubation, appear to us to have paid too much regard to the dates or periods at which they have observed the different events of incubation to occur. Much exactness with respect to dates is not of material consequence, and if it were, it is not practicable, for the progress of incubation depends so much upon climate, season, and the diligence of the parent, with many accidental circumstances, that hardly any two eggs agree precisely in their state of growth, at any given period of incubation: we are not, therefore, to wonder at the difference amongst writers upon this subject with respect to chronology.

The proper heat for the hatching of hens' eggs is 104° of Fahrenheit, to which degree the surface of the body of the hen will raise the thermometer when she sits upon her eggs. In those birds that do not sit constantly, but trust to the heat of the sun, the temperature of the eggs is probably below 104 degrees.

The full period of incubation by the *hen*, in this country, is well known to be 21 days. In warmer climates it is said to be a day or two less. The periods of incubation vary much in different species of birds: we introduce the following table, which has been compiled from different authors by count Morozzo, in a letter from him to Lacépède, to shew the periods of incubation compared with those of the life of certain birds.

Names of Birds	Periods of their Incubation.	Duration of their Life.		Authority.
		Days.	Years.	
<i>Swan</i> -	42		about 200	Aldrovandi.
<i>Parrot</i> -	40		— 100	Wolnaer.
<i>Goose</i> -	30		80 or more	Willoughby.
<i>Eagle</i> -	30	}	period of life not known.	
<i>Bustard</i> -	30			
<i>Duck</i> -	30			
<i>Turkey</i> -	30			
<i>Peacock</i> -	26 to 27		25 to 28	{ Aristotle and Pliny.
<i>Pheasant</i> -	20 — 25		18 — 20	{ A Treatise on Pheasants.
<i>Crow</i> -	20		100 or more	Hesiod.
<i>Nightingale</i> -	19 to 20		17 to 18	Buffon.
<i>Hen</i> -	18 — 19		16 — 18	Buffon.
<i>Pigeon</i> -	17 — 18		16 — 17	{ Several observations.
<i>Linnet</i> -	14		13 — 14	Willoughby.
<i>Canary</i> -	13 to 14		13 — 14	{ A Treatise on these Birds.
<i>Goldfinch</i> -	13 — 14		18 — 20	Buffon.

Crane and *heron*, as well as *ostrich*, hatch their eggs chiefly by the heat of the sun. Journ. de Physique Ventos. an. 10.

The usual mode of examining the progress of incubation, is to gently fracture the shell, and pick it carefully off in pieces with a pair of forceps. This should be done at the large end, as it is there the changes of incubation commence, and at all periods it will be found the most convenient place for breaking the shell, on account of the air-cell being interposed between it and the fluids of the egg. For particular purposes other modes of preparation must be employed. If it be our object to study the formation of the membranes, these must be separated from the humours, and after being cleaned by being passed through several waters, they are to be floated in weak spirits over a blue paper, or some other dark coloured substance. The strongest spirits, distilled vinegar, or a solution of alum, are necessary to render the organs of the foetus sufficiently plain for examination. The only use of boiling the contents of the egg, is to shew the relative situation and magnitude of different parts.

In many observations, it is necessary to magnify by glasses the subjects of investigation; we would however recommend, that the sight be only assisted by the single lens. When a higher power is employed it is liable to deceive.

After the egg has been sat upon for 12 hours, the quantity of air contained between the two layers of the membrane that lines the shell, is found to be a little increased.

No evident change is yet to be observed with respect to the bulk or consistence of the humours.

The white spot on the superior surface of the yolk, which contains the *cicatricula* of the ancient anatomists, or the *follicle* of Haller, is now somewhat enlarged. There appears, in its interior, a small white body of an elongated and indistinct figure, which is surrounded by a line of a deep yellow or greenish colour. If this part of the membrane be removed and examined with a lens on the under surface, after being a short time immersed in spirits or vinegar, it will be discovered that the elongated white body is the rudiment of the *fatus*, which is already inclosed in the *amnios*. The greenish appearance would seem to depend partly upon the existence of the *amnios*, and partly upon a depression on the substance.

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substance of the yolk, which is the origin of the bed of the chick. We cannot determine whether this depression contains a fluid or not. The part of the white spot which surrounds the depression that contains the fœtus, is occasioned by the substance of the yolk having a peculiar organization. At that point it is white, and has a curdy or coagulated appearance. Malpighi believed that he could discern the fœtus as early as the sixth hour, and even before the egg had been fat upon; but most other observers have not been able to see any appearance, which they thought deserved to be considered as the fœtus, before the 12th hour. It is, however, probable, that the embryo of the chick is formed after impregnation, although from its extreme tenderness and obscurity of figure, it cannot be detected until it is a little developed by incubation.

The *amnios* appears to be coeval with the chick.

The *rings* or *circles* (*halones*) that surround the cicatrix, are now somewhat enlarged, and more defined in their outline. They also assume a little of an oval figure. The external circle is undulating, or forms waves, through which the colour of the yolk appears. Maitre Jan describes four halones, Haller only three; we have found the number vary. This appearance of circles is not easily accounted for. We have thought it arose from the separation of the membranes into their proper layers.

First Day, or after 24 Hours.—Upon opening an egg at this period, it is perceived that the space formed for the admission of air between the layers of the external membrane is a little more enlarged.

The *external white* appears scarcely diminished; it is fluid and transparent, and runs out at the opening if the egg be inclined to that side.

The *yolk* is found to float higher in the principal white than before incubation, and appears a little flattened upon the upper surface.

The *halones* are more extended, particularly the outer one. The internal one has acquired a little of a heart-shape, and is surrounded by a more defined line of a greenish colour, which is the first appearance of the outline of the venous area. There are also some faint and imperfect traces of green vessels, or rather elongated points, to be detected in different parts of the space inclosed by this line, which are the rudiments of the vessels that are to compose the area.

The *amnios* is well formed, and composed of two circles which unite two straight lines, resembling the figure of a pebble.

The *fœtus* has a more determined figure; it is larger at both extremities than in the middle; but the end which corresponds to its head is larger than the other, and forms an oval mass. Maitre Jan states that if an egg, after being under the hen for 24 hours, be put into water, it will float with the small end downwards, which is a proof that a part of its fluids is lost, and replaced by the admission of air into the air-cell at the great end of the egg.

After 36 hours we have found the greenish line, already mentioned, to have still more plainly the appearance of a vessel. It encompasses a larger area, and assumes more completely the contour of a heart. The greenish points also now are continued into each, and put on the appearance of vessels, which are most numerous next the circumference of the area, but present no evident connection with the fœtus. Some of these vessels are seen to contain red blood, more particularly those which pass between the head of the chick and the upper part of the vessel in shape of a heart. In some eggs, at this period, we have found these red vessels approach the chick but not join it: in others they were collected by a single branch, which passed behind the head of the chick.

This branch Leveille has called the *meningo-cardiac vein*, and others the *vena ascendens*. There is considerable variety with respect to the period at which red vessels begin to appear. We have seen them before the 36th hour, but oftener, perhaps, not before the 40th, or even later. Authors differ extremely on this point. Malpighi represents the commencement of the vessels at the 30th hour (Append. figs. 18 and 19.), and even delineates them at the 12th hour. (Epist. 1. fig. 5.) Stenon observed them at the 71st hour; Vesling at the 43d, but saw the points at the 42d hour. Aldrovandus found them the third day. Maitre Jan described the first appearance of vessels at the 38th hour, and represented them distinctly formed, and carrying red blood at the 44th hour. (P. 53 and 58, and fig. 10.) Haller noticed some reddish points at the 36th hour, and to the 48th, but did not perceive perfect red vessels before the end of the third day. *Memoire ad fur la Formation du Cœur dans le Poulet*, &c. p. 23.

These contradictory accounts depend in some degree upon their authors not having sufficiently attended to the existence of colourless points and vessels before the formation of red blood.

Haller states, that he observed, at 31½ hours, the head of the *fœtus* to have the appearance of being split, which he attributed to the vesicles of the brain having a small degree of opacity, whilst the membranes composing the cranium were so transparent as to be seen through. Malpighi also represented this appearance. We have not noticed it.

Haller likewise describes the head of the chick to begin to form at a right angle with the tail at the 40th hour.

After 48 hours, or two days, the external *halones* occupy a considerable extent upon the surface of the yolk, and become fainter in their appearance.

The *liquid* or *external white* is somewhat diminished.

The *principal white* begins to subside to the bottom and small end of the egg.

The *yolk-bag* appears flatter upon the upper surface, and its contents are a little more fluid than before incubation.

The *chalazæ*, which were originally situated at the two poles of the yolk-bag, are now found somewhat below them, and consequently rather nearer to each other.

The *vascular area* (*figure veinense* of Haller) is now in general completely formed with colourless and red vessels. The number of the latter is very variable. We have found them at this period in very different states of advancement, but always discoverable by the greenish vessels which precede them. The area has very perfectly the figure of a heart, except that the part corresponding to the basis is formed by the outline of the two sides being considerably curved before their junction in the middle, at which place the outline of the area forms a pointed projection downwards, which nearly reaches to the head of the fœtus. It is this part of the area which receives the branches of the meningo-cardiac vein already mentioned. The vessels are now also connected with the chick by means of their principal trunks.

The *pulsation* of the *heart* is evident at this period, and even in some hours before, according to Maitre Jan's observations. It appears to be produced by the alternate contraction and dilatation of two or sometimes three vesicles. This appearance is the *punctum saliens* of the older anatomists, and has been commonly, but erroneously, reputed the first action of life.

One mode of preparing eggs for examination is to remove a portion of the membranes including the fœtus and vascular figure around it, and having washed off any pieces of the yolk that may adhere to them, immerse them for a short time in strong spirits or distilled vinegar, by which means the pulpy

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pulpy substance that composes the chick is rendered opaque and visible, and the structure of the membranes more distinguishable.

If this step be taken with the egg at the present period, or even before it, a fine glossy transparent membrane will be found upon the external surface of the yolk-bag, which is very readily detached, leaving the fœtus and the vascular area beneath. This membrane, we conceive, is the same which, strengthened by the vesicula umbilicalis, becomes the one which at last entirely envelopes the contents of the incubated egg.

The membrane, containing the *vascular area* at the second day, may be distinguished to be composed of two layers; the external is smooth, and receives the vessels; the internal is a little thickened and spongy. The remaining portion of the yolk-bag is not separable into different layers. From hence it would appear that the division into layers is the consequence of vessels being distributed to the membrane.

The *amnios* is now found a little larger, and the transparent fluid with which it is filled in greater quantity. The superior circle also, or that which incloses the head of the chick, is larger than the lower.

The *fœtus* has altered its shape a little. The head has acquired something the figure of the ace of clubs, the anterior prominence of which corresponds to the nose and mouth; and the two other projections are the vesicles containing the brain in a very soft pellucid state. Maitre Jan states that the eyes also are visible at this period. (P. 77.) Haller did not see the eyes before the 51st hour, at which time they had not any colour, and were merely distinguishable from the other parts of the head, by their prominences and situation. Sect. xii. Second Memoir.

The *heart*, before the chick is removed from the membranes, and rendered opaque by immersion in spirits, appears to be situated on the outside of the body, and the pulsating points seem unconnected with each other; but upon a close examination it is seen that the heart is not uncovered, although, from its projection, and the natural transparency of the parietes of the chest, it had every appearance of being so. The heart altogether resembles a horse-shoe in form, or a portion of a circle, of which the convexity is turned forwards, and the limbs backwards, one being directed to the upper part of the chest, and the other to the lower. The heart at this time consists of an auricular canal, a ventricle, and a bulbous enlargement belonging to the aorta. The two last are the salient points, and when the chick is so far advanced that the auricle is formed and pulsates, which is sometimes the case at the 48th hour, there are three salient points to be seen. Maitre Jan describes four salient points, and supposes that they are the rudiments of the two ventricles and two auricles of the heart. At other times, he says he has sometimes seen but three pulsating points, or perhaps two, or only one. Haller, who paid particular attention to the development of the heart of the chick, contradicts Maitre Jan's account. At the 48th hour he could discover but two salient points; at the 50th hour he saw three, but on no occasion more than that number. He supposes that when there are two salient points the auricle does not pulsate, and when only one the bulb of the aorta is without motion. Memoire i. p. 83.

The End of the third Day, or Seventy-two Hours.—This is a very important period in the history of incubation.

The separation of the layers of the external membranes for the admission of air continues to increase.

The *halones* are scarcely to be discovered. The *yolk* is more extended, and the *white* continues to gravitate to the lower parts of the egg.

The *vascular area* is now generally found to be perfected with red vessels. The contour of the area is more extensive, particularly in the transverse direction. The diameter being now about an inch and a quarter, it has therefore less the shape of a heart: the pulsation of the three vesicles, and distribution of the blood-vessels, are very clearly seen through the transparent membrane which covers them.

The *amnios* begins to assume the figure that it is afterwards to possess. The two circles which encompass the head and the tail of the fœtus become enlarged, principally on the fore-part, or the side next the right-hand of the observer; but the sac is a little contracted on the same side opposite to the umbilicus of the chick, thus tending, in a degree, to give the *amnios* the form of a kidney.

The *fœtus* has a curved position forwards, and its body appears larger in proportion to its head, than on the preceding day.

We have forborne to describe particularly the *heart* and *blood-vessels* of the chick and area until the present period, when they are more distinctly seen.

In order to discern perfectly these parts, the membrane including the fœtus and vascular area should be removed from the yolk-bag, floated in clear water, and examined with a lens. The vascular area contains four or five principal venous branches, which ramify upon the membrane, and produce a very close and intricate net-work towards the circumference of the area. These branches appear, when the chick is in the natural situation, to be so many distinct trunks. Two of them are seen to come from the sides of the chick, a third from under the tail, and one, or sometimes two, branches from under the head of the chick. The two first are commonly called the *umbilical vessels*, as they come out of the chick at the umbilicus: they would, perhaps, with more propriety, be called mesenteric veins, as we have much reason for supposing that they are the same which are so plainly branches of the mesenteric vein in the latter stages of incubation. At the present period they terminate in the vein which corresponds to the vena cava and vena portæ. Both the branches which emerge from under the tail and head of the fœtus are found to be given off from the umbilical veins just outside the body of the chick. This origin is concealed from view until the lower surface of the membranes and chick are carefully examined. Several anatomists seem to have published errors with respect to the superior or ascending vessels of the vascular area. They are often described as distinct branches, which are lost on each side of the notch or chink, which has been already mentioned to exist during the first days of incubation in the contour of the vascular area. They were, therefore, sometimes supposed to be separate vessels. Langly represented them to be at first distinct branches, which united at the 61st hour; but Malpighi, Maitre Jan, Haller, &c. state that these two branches always unite into one behind the head of the fœtus when they do not sooner. Malpighi, Maitre Jan, and others, however, represent this vessel as coming from the heart: Maitre Jan even supposes it may be the ascending aorta. Our observations, nevertheless, lead us to agree with Haller respecting this vessel, who states it to be a branch of the umbilical vein. It is this vessel to which Leveille has given, as we conceive improperly, the name of *meningo-cardiac vein*.

The vessel which forms the contour of the vascular area has been commonly described as a single vein: Malpighi, however, represented it as being composed of an intertexture, or plexus of the ultimate branches of the veins which are spread over the vascular figure. There appears to be some foundation

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tion for both these accounts, according to our observations : thus we have sometimes seen with a lens the appearance described by Malpighi, and at the same time the single trunk nearly transparent from wanting red blood, and enveloped and concealed by the intricate and close plexus formed by the extremities of the veins of the external part of the area. We believe, however, that there is in every case originally a single vessel which makes the outline of the venous figure or area, and which exists previously to the vessels which communicate with the chick. It is not uncommon to find this vessel deficient at some parts of the circumference of the area, more especially at the superior part, where the outline makes the pointed projection inwards towards the head of the chick. Sometimes a vein is seen to pass across the chink formed by the outline at this part.

The arteries which go to the vascular area bear no proportion to the veins. They are so small that they are not easily seen, and even have been by some supposed not to exist. The left umbilical artery is in general much more considerable than the right; indeed we have sometimes doubted whether the latter existed or not. They accompany the veins in their course, but are not supposed to have any immediate connection with the vessel which forms the contour of the area. Besides the small size of the arteries at this period of incubation, they are difficult to discover on account of all the blood-vessels of the egg carrying blood of the same colour. During the first days the blood is a bright scarlet, or possesses an arterial character. The parts composing the heart of the chick, although formed several hours before, are now particularly evident. The vein, which in the first periods conveyed the blood from the vascular area to the horse-shoe dilatation corresponding to the heart, is now seen to be the vena cava, or rather it should be considered as the vena porte and cava together. At the superior part of this vein a dilatation is formed, which is prolonged transversely forwards, and inclines a little downwards. This dilated part, in which the vena cava ends, is the origin of the single auricle of the heart of the fœtus, and is the first vesicle in order which is seen to pulsate.

Towards the end of the third day, according to Haller, the enlargement of the head of the vena cava becomes greater, and is distinguished from the rest of the vein by a whitish-coloured interval; it is still, however, but a single cavity: its greatest diameter is across from the right to the left side of the fœtus. The canal which conveys the blood from the auricle into the ventricle (*le canal auriculaire* of Haller), exists, as already mentioned, before the vena cava becomes dilated to form the auricle, at which time it might be considered as the continuation of the cava. This canal is, therefore, one of the first formed parts of the heart. It is most long and slender when it first appears, and gradually contracts in length, until it is lost in the substance of the heart. It is smallest where it arises from the auricle, and widest where it opens into the ventricle: its diameter, however, is always less than that of the latter. It enters the ventricle on the left side, for which purpose it descends a little, and therefore crosses the aorta, which arises from the ventricle on the right side and ascends backwards. There arises from the decussation of these two vessels the appearance of a kind of knot, and the auricular canal seems to double upon itself, in order to be continued with the aorta in the opposite and concealed side of the knot.

When the auricular canal is viewed on the right side, its extremity is concealed, and the manner in which it opens into the ventricle cannot be perceived: it seems rather as if separated from the ventricle by a line which is the border of

the heart. But if it be viewed on the left side, there is no difficulty in discovering its communication with the ventricle.

The *ventricle* is a single cavity during the first four or five days of incubation; or rather, the left ventricle exists only at that period. When the two ventricles make their appearance, it is in consequence of the right ventricle being added to that which had already been formed. The left, or single ventricle, arises out of the ring-shaped vessel, which constitutes the first appearance of the heart, and probably is the first point which pulsates. It is an oval vesicle, with transparent parietes in the commencement; but it soon acquires more of a conic figure, with a pointed apex, and greater thickness and muscular power: it is, however, very nearly oval at the present period.

The *aorta*, as already mentioned, is coeval with the first appearance of the heart, and exists before the formation of the auricle. It is then very long, and its arch is much greater in proportion to the length than in the succeeding periods of incubation, as in the adult bird. It makes an extensive curve backwards, in order to enter the chest, immediately under the head, and composes a considerable part of the ring which represents the heart. On the left side this artery appears as if cut off by a line which terminates the heart. The auricle, when formed, is surrounded by the arch of the aorta, which is superior, and more forwards.

A few hours after, the part of the aorta which appears to be outside the chest, becomes shorter, and some inequality is perceived in its diameter. The part of the aorta, which immediately arises from the ventricle, is more contracted than any other; and the wave of blood which is seen to pass through it is very slender. Haller gives the name of the *strait* (*le détroit*) to this part.

The next part of the aorta is a dilatation, to which Haller has given the name of the *bulb* of the aorta. This portion of the vessel, as already mentioned, constitutes one of the pulsating points, and is seen to beat even before the auricle. The bulb of the aorta has been mistaken by Malpighi for the left ventricle, which, considering its lively and early pulsation, was not unnatural. He likewise was led by the same error to take the single ventricle, which is actually the left for the right, or pulmonary ventricle of the heart.

The third portion of the aorta is cylindrical; its direction is changed, and it represents with the preceding a point or beak. It is smaller than the bulb, but larger than the branches which go to produce the dorsal aorta. Haller calls this part the *bec de l'aorte*.

Soon after the present period, and before the end of the fourth day, there are branches seen to arise from the beak of the aorta, in order to form the dorsal portion of that vessel.

The three parts which compose the heart of the fœtal chick pulsate so rapidly, when examined immediately after the egg is opened, that the eye cannot follow them; but in proportion as the chick becomes cold and feeble, the intervals between the pulsations become longer. The pulsations may be thus gradually reduced to fifteen, to ten, to five, or two, or at last even to but one in a minute; nevertheless, the celerity with which each contraction is performed is scarcely diminished.

When the pulsations of the heart are rendered sufficiently slow to be counted, they are perceived to follow each other in a regular succession. The auricle always beats the first of the three vesicles. In its systole the point descends, and the sides are approximated: it scarcely ever appears to expel

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entirely the drop of blood it contains, and therefore it retains almost constantly a degree of red colour.

The wave of blood which proceeds from the auricle appears to vanish, as one cannot see its course into the ventricle unless the heart be beheld obliquely from above: then the blood will be seen to pass along through the auricular canal, which, as before observed, is concealed by the ventricle.

The contraction of the ventricle succeeds to that of the auricle: it approximates its sides, and becomes narrower and shorter. The ventricle frequently becomes quite pale during its contraction, owing to the entire expulsion of its contained blood.

After the contraction of the ventricle follows that of the bulb of the aorta, which pulsates as quickly and perfectly as the ventricle itself. It empties itself completely at each contraction, and therefore appears quite pale at these moments.

The pulsatory movement terminates at the origin of the three vessels which go to form the dorsal aorta, and this vessel declines very much in bulk opposite to the umbilicus; the branches which go to supply the inferior parts of the fœtus being very insignificant.

The different membranes become more distinct at the end of the third day than they were before. At this period also the first appearance is seen of that remarkable membrane, which is called by some *allantois*, and by others *vesicula umbilicalis*.

When a portion of the membrane is removed containing the vascular area and the chick, and washed and spread out in clear water, it is found to contain four layers. The first is thin, transparent, and shining, and resembles that which forms the yolk-bag before incubation. It very readily separates from the other layers. The second is also transparent, and still thinner than the first, but is more adherent to those underneath it. The third is the membrane in which the blood-vessels are distributed that form the vascular area; and the fourth is the internal or spongy membrane of the yolk-bag. The third membrane seems to grow with the vascular area, by which it appears to be bounded: the internal membrane of the yolk-bag is at this period a little spongy or villous at every part, but much more so under the vascular area than at any other place.

The chick inclosed in the amnios is situated between the two first and two last of these membranes.

The *vesicula umbilicalis*, when first discovered, makes its appearance as a small spherical transparent bag, which projects out of the opening into the abdominal cavity of the chick, that is left by the reflection of the amnios inwards. At this period, and for some time afterwards, it is distended by a clear fluid.

The end of the fourth day, or ninety-six hours, the appearance of *balones* is in general no longer to be perceived.

The *vascular area* is so much extended that it occupies near the half of the superficies of the yolk: the outline has no remains of the heart shape, but has assumed an oval figure, the greatest diameter of which is in the transverse direction of the chick.

The *air-cell* continues to enlarge at the great end of the egg.

The *external* or *liquid white* appears to be all consumed.

The *principal white* is chiefly to be found in the lower parts of the egg, and when poured out is seen to adhere a little to the internal layer of the membrane of the shell at the small end of the egg.

The *yolk-bag* is still flatter in its figure than before, and its contents are evidently more fluid than they were previous to incubation.

The *chalaza* continue to approach each other below the poles of the yolk-bag.

The *amnios* is considerably increased, contains more fluid, and forms a deeper bed for the chick on the membrane of the yolk-bag.

The *vesicula umbilicalis* has made a rapid progress since the end of the third day. It now projects considerably beyond the fœtus. It appears flatter, and less full of fluid than at first; and at this period, by examination with a magnifying glass, a vessel may be seen to ramify upon it.

Upon opening the yolk-bag, and washing off the yolk, the spongy coat is seen to be elevated in the course of the blood-vessels of the vascular area: this is the first appearance of the valvular structure of the yolk-bag, of which more hereafter.

The *fœtus* is still more curved in its form, the prominence corresponding to the bill being bent down upon the breast. The rudiments of the upper extremities are apparent: they are two white buds or short projections. The lower limbs are likewise produced, but without any more form. The cerebral vesicles are more eminent; and, when opened, their contents are found, though still pellucid, to be mixed with some whitish fibres, which form opaque clouds, and are the commencement of the brain.

Haller found the *heart* beginning to undergo some changes about this period. The *auricle*, when viewed in the usual manner on the right side of the fœtus, is seen to contain two semicircles. The most posterior of these, or the one nearest the vertebræ, is the largest, and terminates the auricle. The anterior semicircle is smaller, and divides the auricle as a kind of septum. This is the first appearance of the distinction of the auricles into two. That which is to be called the left is the larger, and projects over the right posteriorly. The latter, which is the smaller, has a semilunar termination, which is comprised in the breadth of the left auricle. The vena cava and the auricular canal are inserted in the interval of the two auricles.

The distinction of two auricles is likewise to be seen on viewing the heart on the left side. That which is to become the left is oval, wider than the other, and passes beyond the auricular canal.

At the end of the fourth day, or soon afterwards, the two auricles become more separate from the vena cava and the auricular canal. They project over these vessels, and are elevated from the two sides of the base of the heart into a pointed top. The whole of the auricle, or the united reservoir of the right and left auricles, appears then as a sac with two pointed horns: each of these pointed tops has a separate drop of blood. The border of both the auricles appears at this time notched. Mem. 2d sur la Formation du Cœur dans le Poulet, &c. par M. de Haller, p. 70.

The *auricular canal*, towards the end of the fourth day, passes more in a direction from above downwards than formerly.

According to Maitre Jan, the rudiments of the *lungs* are visible at this period; but Haller asserts that they do not appear before the 138th hour. The former author describes at this time, in the neighbourhood of the heart, little reddish clouds, apparently of a spongy nature, which appear more or less red, alternately, as the heart moves, and which remain of a uniform colour when the heart has ceased to beat. Maitre Jan admits that the pulmonary vessels cannot yet be discerned, but supposes from the above effect of the heart's motion, that they do exist, although they are not visible. (Observat. sur la Formation du Poulet, par Maitre Jan, p. 115 and 122.) —Not having examined this point, we cannot decide between these authorities, but we should judge it improbable, that the

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pulmonary vessels could regularly transmit blood to the lungs, and yet not be visible.

Both Haller and Maitre Jan agree that the *liver* makes its appearance towards the end of the fourth day. It is seen as a viscous cloud of a reddish yellow colour, situated between the umbilical vessels and the descending aorta. It is rendered more visible and opaque by moistening it with distilled vinegar.

The *eye* of the fœtus appears black, the choroid coat being formed; and the superior part of the eye chiefly presenting itself to view, the pupil is situated in the inferior portion of the eye.

The end of the fifth day, or 120 hours, the *vascular area* is so much extended as to cover generally more than half the superficies of the yolk-bag. The trunks of the vessels are proportionally increased in size, but the branches near the circumference are not so much advanced. Some additional vessels are seen to proceed from the umbilicus of the chick towards the left side of the area. These appertain to the *vesicula umbilicalis*, as will be better understood hereafter. All the blood-vessels of the area, which were in the first days of incubation of a fine scarlet, are now commonly found of a dusky red colour.

The *amnios* continues to increase in magnitude, and contains so much fluid, that the chick appears to be surrounded by a green liquor.

The *chick*, especially when excited by a little external heat, can be perceived to move its limbs.

When the external membrane is removed, the *vesicula umbilicalis* is found to be considerably larger than it was the preceding day. It is likewise perceived to have contracted some adhesion with the external membrane, which however is undone by a slight force, particularly after the membranes have been a short time immersed in vinegar or spirits.

The branches of blood-vessels which are distributed upon the *vesicula*, belong to a trunk that comes out through the opening of the abdomen at the umbilicus of the chick. The *vesicula* is connected with the fœtus by means of a neck, or contracted part, which is likewise received into the abdomen at the umbilicus.

Maitre Jan describes at this period a number of fine branches of blood-vessels upon the skin of the chick: we have not, however, observed these so early.

When the internal surface of the *yolk-bag* is examined, it is found that the eminences upon it, already mentioned, have assumed the form of vessels ramifying from the centre, where the chick is situated, to the circumference of the vascular area. This appearance has been mistaken by many of the older anatomists for real vessels distributed upon the inner surface of the yolk-bag, and were supposed by some to be designed to convey the yolk to the chick. When the appearance of the yellow vessels of the yolk-bag is first presented, it is very difficult to detect the real occasion of it, but as it advances, it becomes plain that the effect is produced by the inflection or doubling of the inner membrane of the yolk-bag, in the course of the real blood-vessels of the bag. By a careful examination of the matter with a lens, even at this period, we have always perceived the appearance of yellow vessels to arise from the blood-vessels running in grooves, or reflections of the inner membrane. When the two tunics of the bag are separated, the blood-vessels are found to belong to the external, upon the inner side of which they appear as eminent lines; while upon the external side of the inner coat there are corresponding grooves or impressions.

The *heart* at this period begins to undergo the changes by which it approximates in structure the heart of the adult bird. It becomes perpendicular, or in the line of the fœtus,

from being placed in a transverse direction. The point is recurved between the two lobes of the liver.

The *auricles* become more distinct, and the interval between them white.

The *auricular canal* is considerably shortened.

The *second or right ventricle* begins to be formed before the termination of the fifth day. It appears as a little sac under the bulb of the aorta. It is much shorter than the original ventricle, above which it is placed. Its figure is oval, and it has a red colour. In a short time the new ventricle is seen in its proper situation, that is, on the right side of the heart. Haller states that he found it placed on the right as early as the 117th hour. There are then two distinct drops of blood in this part of the heart of the fœtus, and a white line is perceived between them.

The *aorta* arises from the left ventricle. The branches, which are furnished in order to form the dorsal aorta, have an inclination downwards, and unite in an acute angle. At this period also the bulb of the aorta begins to diminish, and to retire into the flesh of the heart.

The *liver* is more distinct than at the end of the preceding day; it is divided into lobes, and is of a pale or yellowish red colour. Its vessels receive blood.

Haller first perceived the rectum at this period, although the stomach and other intestines were not yet formed. It appears in the shape of a trident, the lateral processes of which are produced by the rudiments of the two cœca.

The End of the 6th Day, or 144 Hours.—Eggs placed so long under the hen are considerably diminished in weight, which is even perceivable on taking them into the hand. The shell begins to appear more dry, and opaque coloured, and is more fragile than before incubation.

The diminution of weight depends upon the enlargement of the air-cell, which now extends over a considerable part of the great end of the egg. Maitre Jan has taken some pains to prove that the air contained in the egg is not derived from the atmosphere. He supposed that the fluids filtered through the inner layer of the membrane which lines the shell, and that by the action of heat, they were volatilized or converted into air. This opinion is not only improbable, but refuted by particular facts. On opening the air-cell, we do not find its surface to possess any moisture; that layer of the membrane which lies next the humours of the egg, although less thick, is smoother, denser, and less porous than the layer immediately in contact with the shell, and therefore less fitted to admit the transpiration of either fluids or air. The chemical properties of the gaseous contents of the air-cell seem to put it beyond all doubt that the atmospheric air passes into the egg. (See the article *Egg*.) We shall only add, that when we have varnished the external surface of the shell the air-cell no longer increased in size.

Upon opening an egg at this period of incubation, it is not unusual to see the chick turned upon its back, instead of lying, as before, upon its left side. This circumstance seems to depend upon the amnios having so much increased in size that the fœtus may roll round within it.

The membranes around the chick begin to acquire more strength and firmness, which is the consequence of the *vesicula umbilicalis* becoming more closely and extensively united to the external membrane.

The *vesicula* is now found to be very much increased in magnitude, and to cover a considerable portion of the yolk-bag. When the membranes surrounding it are cut open, and the vesicle exposed, its neck or peduncle may be traced as a fine transparent tube to the rectum, by a careful examination, particularly if the parts have been rendered opaque, by being

being a short time steeped in vinegar or strong spirits. Where it opens into the rectum it is dilated.

The connection that exists between the vesicula umbilicalis, and the end of the rectum, by means of a tube analogous to the urachus, has induced Haller and others to consider this bag as the reservoir of uriae.

We shall find in the subsequent periods of incubation, that the vesicula umbilicalis performs very important and other functions than those of a reservoir of urine, in which, nevertheless, it does not perhaps materially differ from the allantois of quadrupeds.

It is necessary here to notice an error which two of the best writers upon the subject of incubation have fallen into with respect to the vesicula umbilicalis. Both Malpighi and Maitre Jan supposed it to be a part which afterwards became the stomach of the chick. This mistake appears to have been occasioned by the vesicula becoming, as we shall afterwards describe, so much extended as to lose the figure of a bag, and from being united to other membranes, only to be distinguished with difficulty. Its being visible nearly three days before the stomach; acquiring even then a much greater size than that viscus possesses, and differing essentially in figure and texture, should however have prevented these two parts from being confounded with each other.

The chick, on the sixth day, has assumed a good deal of its natural form. The extremities are so much developed, that the divisions of these members are visible. The wings have their bent figure, and the legs are added to the thighs.

This period is likewise marked by the first appearance of most of the important organs of the body, besides some changes in those already formed.

Haller states that he could discern the *pericardium* at this time.

The two *auricles* are still more distinct than at the end of the preceding day.

The *auricular canal*, which had before begun to retire within the flesh of the heart, is now not visible.

The *ventricles* are better formed, and broad at their base.

The *bulb*, the *strait*, and the *beak* of the aorta, which gave origin, in the early periods, to the principal arterial trunk, are in general not apparent at the end of the sixth day. This vessel is seen to come forth from the basis of the heart itself.

The *pulmonary artery* was seen by Haller first, about the middle of the sixth day. This vessel is less firm and opaque than the aorta; it arises from the left side of the basis of the heart with a little bulb. It is usually of less diameter than the aorta. Almost at its exit from the heart it divides into two branches.

The branch on the left side forms an arch, in order to reach the lung of that side in passing behind the bronchia: it joins the aorta, towards the third vertebra of the back. The branch of the pulmonary artery, which is inserted into the dorsal aorta, is longer than the *ductus arteriosus* of quadrupeds, to which it is analogous. It should, however, receive the name of *left*, as birds have a similar arterial duct upon the right side. The left lung receives a considerable branch from the ductus while on its way to join the aorta.

The other principal branch of the pulmonary artery passes transversely to the right side, under the aorta; to which it adheres. It furnishes the artery to the right lung, and descends behind the bronchia, in order to open into the aorta, higher than the left branch already mentioned. The right arterial duct is much smaller than the left.

These arterial ducts are two of the three branches, which

have been described in the preceding days as contributing to form the dorsal aorta. The right duct is later in appearing than the other, and hence, when the aorta is first discovered, it is observed to be only formed by two branches.

About this period the *lungs* have sufficient consistence to be visible. When they are rendered opaque by vinegar, they are found to be not so small, that they might not have been seen some time before if their transparency had permitted it. Their figure is cylindric. They are attached posteriorly to the back, and connected with the two sides of the heart.

The *liver* has acquired more of its future form than it had the preceding day.

The *stomach* is apparent at this time. It is very thin and tender, and resembles a good deal the form of the human stomach; its orifices are, however, nearer to each other. The stomach is received between the lobes of the liver.

The fluid contained in the *cerebral vesicles* has acquired by this time some consistence.

The *kidnies* are discovered during this day as long reddish granulated lines or traces in the loins.

The End of the 7th Day, or 168 Hours.—Upon opening an egg at this period, we perceive that the changes already mentioned in the form, consistence, and situation of the humours have continued to increase.

The *white* tends more towards the lower part and small end of the egg: it continues to diminish, and to become more tenacious in its composition.

The *yolk* is more fluid, more spread out, and apparently of a larger size than before. Haller nevertheless found it at this date to possess its original weight.

The *blood-vessels* which are distributed upon the membranes, and which were in the first days, as before mentioned, of a brilliant scarlet, are now in most eggs found to be all of the purple or venous colour. The uniformity of colour makes it difficult to distinguish the arteries: they can indeed be only ascertained by dissecting the membranes and pursuing the course of the vessels into the body of the chick.

The *amnios* is still larger at this than any previous period; it preserves its kidney form, and its fluid is transparent, and cannot be rendered opaque, or coagulated by vinegar or spirits.

The *vesicula umbilicalis* goes on increasing in size, and its vessels acquire strength.

The *chick* has its members more developed. The *feet* are added to the posterior extremities, and even the *toes* can be discerned. Ossification has commenced. Haller states that he prepared the *femur* and *tibia* at the 146th hour. The *two mandibles* begin to form at the under part of the head, leaving an aperture between them, which is to be the mouth.

Haller at this period observed the first convolutions of the *small intestines*, which were so extremely tender as not to admit of being touched, although the rectum was apparent two days before.

The *spleen* now first makes its appearance. Haller supposed that he could likewise discern the *renal capsules* and *ovaries*.

The intermediate of the three vessels which arise from the heart to form the dorsal aorta, is, about this time, seen to furnish the *two carotids*; it is the same vessel which becomes the *descending aorta*, when the structure of the pulmonary artery is completed. Haller states that the pulsation of the aorta ceases after the 154th hour.

The *eye* of the fœtus is considerably developed at the present period. The three humours exist: the *vitreous* is extremely

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extremely abundant, upon which depends the great bulk of the eyes of the chick about this time. The *lens* is small. The *iris* is formed, but is very transparent. The trunks of the *optic nerves* and *retina* are visible. The latter is transparent and plaited, and seems to go as far as the lens. The radiated black lines which form the *corona ciliaris* are seen through the retina, placed around the external part of the lens.

The End of the 8th Day, or 192 Hours.—The *vascular area* has increased so much by this time, that it very nearly covers all the superficies of the yolk-bag, except what is in contact with the white. The branches of vessels, however, begin to decline or disappear in some parts, particularly towards the circumference, although the trunks are larger than at any former period.

The blood-vessels belonging to the *vesicula umbilicalis* are considerably enlarged and extended, and are now seen to turn backwards, or be reflected upon themselves in the direction of the chick. The reflected portion of the vessels of the *vesicula* appears to be distributed to the superior half of that bag which is now in contact with the external membrane. This membrane, which was in the first periods of incubation, as already mentioned, perfectly transparent, by its connection with the *vesicula* becomes vascular, and acquires strength, and contributes to form a complete sac, which envelopes in the latter days all the humours and the chick, as will be hereafter described.

The *vesicula umbilicalis* is found at the present period to have a considerable extent, according to our observations much greater than has been represented by anatomists in general, who do not seem to have been acquainted with the uses of this bag in the later stages of incubation.

The chick is a very pale pink colour, or white slightly tinged with red, in consequence of the vascularity of the surface preparatory to the formation of the skin and feathers.

When the head of the chick is viewed posteriorly, it presents the appearances of four eminences, which are an opaque white, and are joined to each other by transparent membranes. Maitre Jan considers them as the rudiments of the bones of the cranium in a cartilaginous state, and the transparent parts as corresponding to the futures and fontanel. Haller speaks of these eminences as four lobes of the brain. We conceive the account of Maitre Jan to be more correct.

The head being opened at this period by Maitre Jan, he states that he distinguished the *membranes*, the *sinuses*, and the *vessels* of the brain, and that the substance of the *cerebrum* and *cerebellum* was well formed, the *convolutions* even being apparent. This observation, according to our experience, is premature.

The structure of the eye is more perfect than before. The *ciliary zone*, according to Haller, is as perfect at the present period as at any time afterwards. Its description, however, is easier some days later.

The bill of the chick is cartilaginous. The animal occasionally opens it in the water of the amnios as if attempting to swallow.

The breast of the fœtus, which was covered by a thin membrane, that in the first days was so transparent, as to give rise to the mistake of the heart being outside the chest, has at the present time some flesh upon it. About this period also the rudiments of the *sternum* and of the *ribs* may be discovered.

The *gall-bladder* makes its first appearance towards the end of the eighth day, at which period, and for a few days afterwards, it is very small and without colour.

About this time the reflections of the inner tunic of the

yolk-bag, which we have described at the end of the fifth day, as putting on the appearance of yellow vessels, acquire more decidedly the form of valves. They still preserve the same situation and course, commencing under the bed of the fœtus, and extending outwards in a radiated manner towards the circumference of the vascular area, where they terminate. They are made of a number of plaits or folds which have a transverse direction, and which are more prominent, or have deeper folds in proportion as the valvular lines approach the circumference of the circle. They form merely waves where they commence, and at the present period they are on every part of the yolk-bag much less marked and striking than they become towards the end of incubation.

The End of the 9th Day, or 216 Hours.—Maitre Jan mentions the appearance of some new parts at this period which we have not met with so early. He describes the *kidnies* as secreting a milky fluid, which he saw distending the *ureters*. He discovered about this time the *crop* and the *trachea* and was not only able to distinguish the principal divisions of the *brain*, but states that he could discern the *ventricles* with the *eminences* they contained, and even the *plexus choroides*. He likewise saw upon the basis of the brain the greater number of the *nerves* that arise there, more particularly the *optic* and *auditory* nerves, and found the *spinal marrow* to be split or composed of two parts at its origin. He dissected the nerves of the spinal marrow, which, although very small, he states to be much more firm than those which take their origin from the brain. *Observ. sur la Formation de Poulet*, p. 189.

The surface of the fœtus exhibits now a number of pores; these are principally situated upon the thighs, the back, the neck, and the wings, and are the apertures of the cells in which the *feathers* are formed.

The eyes are larger than the vesicles of the brain; their form is not spherical, but flattened upon the anterior and posterior sides.

The *iris* is still thin and transparent; but there are seen through it and the transparent cornea five or six white points which form a circle. When the eye is opened carefully with a lancet, these points are found to be elongated, and to form little lines, or ciliary fibres, which at this period are white.

Maitre Jan states the *eyelids* to be formed at this time, but to be so transparent as to be invisible, unless after preparation by a strong acid.

The *intestines* are now so firm, that they can be examined without danger of breaking them.

The *yolk-bag*, according to Maitre Jan, begins to form two lobes, a larger and a smaller; but we have not observed this change to take place before the 11th or 12th day.

Maitre Jan made the experiment of boiling an egg at this period, after having fixed it upon a plate of lead with its small end downwards. When despoiled of the shell, and the chick removed, the depression in which the amnios lay was fully exposed, and found to be very considerable. He then made a section of the egg in the vertical direction, dividing the depression of the yolk through the middle, when there appeared a round space about the eighth of an inch in diameter, filled with a whitish curdy matter, and another space around this of a larger extent, containing a firmer matter than the first, and of a paler yellow than the rest of the yolk. Maitre Jan, very erroneously in our opinion, supposed the white curdy substance to be the intestines of the fœtal chick. These do not project from the abdomen in sufficient quantity to account for the appearance, admitting that they had been separated from the chick, and had ad-

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hered to the yolk during the boiling of the egg. This appearance, we believe, arises from the same change of organization in the yolk being continued, which in the early periods of incubation produced the whitish appearance under and around the bed of the chick. The firm, pale yellow texture of the yolk which encompasses that just mentioned, Maitre Jan accounts for by supposing that the fluid parts of the yolk in the neighbourhood of the chick had passed into the amnios. There can be no doubt that different parts of the substance of the yolk are differently constituted, which difference is preserved notwithstanding the motions that eggs may experience; a fact that cannot perhaps be fully explained, but which proves that animal fluids have their peculiar organization, which they can maintain as well as the solids. When the fluids change this composition, it is often by some vital action in themselves, instead of a fermentative process, or the mechanical operation of the solids upon them, as is commonly supposed.

In making the experiment of boiling eggs at this period, Maitre Jan did not find that the amnios was coagulated, although Haller stated that the liquid of the amnios is coagulable at the 198th hour.

The *vascular structure* upon the internal surface of the *yolk-bag* is more prominent, and when minutely examined, it is found to receive branches of the blood-vessels which are given off at right angles with the plane of the surface of the bag, and having penetrated towards the edge of each valve, there unite and form a single vessel, which runs within that edge. This structure is better seen a few days afterwards.

The End of the 10th Day, or 240 Hours.—The *vesicula umbilicalis* has now a very considerable extent, occupying the greatest part of the surface of the vascular area, which last is spread over almost the whole of the yolk-bag. The portion of the bag that is applied to the white, is not at this date the $\frac{1}{4}$ th of the whole. The chalazæ, therefore, are much nearer to each other than when we last mentioned them. The white is confined almost entirely to the lower part of the egg, and its mass continues daily to diminish, while, on the contrary, the bulk and quantity of the yolk appears to be increased.

The *external membrane* is firm and fleshy where it is strengthened by the *vesicula umbilicalis*. Some of its vessels are seen to extend to the white, upon which a fine pellicle may be observed to grow, and which is the first appearance of a membrane to this humour, notwithstanding some authors speak of the *membrana albuminis* as an original structure, and others, amongst whom is Blumenbach, describe the membrane which lines the shell as belonging to the white.

The *amnios* is larger, its membrane more firm, and the fluid less clear and limpid than before. It has contracted some adhesions with the *vesicula umbilicalis*, and by that means, with the external membrane. These adhesions are particularly in the course of the blood-vessels, that are distributed to the vesicula and external membrane. One of these vessels is always seen to pass across the back of the chick, at which place it is involved in a reflection of very fine membrane, which is connected with that of the amnios.

The *chick* is very much curved at this period: its beak is usually doubled down between its feet. The *feathers* are apparent.

The external form of the *head* bears a greater resemblance to that of the full-grown bird, except that the eyes are still enormously large.

The *eyelids* are evidently formed, and are occasionally

moved by the chick. The *membrana nictitans* is likewise to be seen.

Haller prepared at this period the *ciliary zone* and radiated appearance called the *crown*, with the membrane on which the latter is sustained, although he states that these parts are formed on the 8th day, or before it.

He says he has seen on the 7th day the *corona ciliaris*, or *corpus ciliare* of Morgagni. At this epoch the retina, which is in thick folds, appears to go as far forwards as the crystalline lens, behind the *corona ciliaris*, with which it is covered, and which is dimly seen across it. He believes, notwithstanding, that the retina does not proceed to the lens; that the appearance of its doing so arises from its thickness and folds leaving so small a space between it and the lens, and that the membrane which supports the ciliary zone and crown, and is attached to the crystalline, is different from the retina.

The *corona ciliaris* is a row of black lines arranged alternately, long and short, in some degree parallel, but converging as rays proceeding from the external circumference of the uvea to the crystalline lens. The ciliary crown is not formed entirely in the same manner in quadrupeds and birds. In the former it appears, when examined by a microscope, to be composed of a plicated membrane, upon which some ramified vessels advance towards the crystalline. In birds there are only some serpentine lines folded upon themselves, which are very numerous in the contour of the ciliary crown, and of which many unite to form single ones: they are joined together by these branches, and are covered with a black pigment.

The figure of the ciliary zone and crown is not a perfect circle, but it is broader on one side than the other.

The greater number of anatomists have described the *corona ciliaris* as resting immediately upon the membrane of the vitreous humour. Others have believed that the retina extends to the crystalline, and that the corona is supported upon it. Since Zinn's publication upon the anatomy of the eye, the structure of the ciliary body in man and quadrupeds has been well understood; but in birds the lamina, which serves for the base of the *corona ciliaris*, does not come from the membrane of the vitreous humour.

The membrane, which is placed under the *corona ciliaris* in birds, is to be seen from the 8th day. It is radiated, opaque, and a little ash-coloured; more thin than the retina, and thicker than the membrane of the vitreous humour. It is of the same dimensions as the *corona ciliaris*, and in a degree attached to the corona, and much more firmly united in the latter days of incubation; and after the exclusion of the chick, it adheres by its posterior extremity to the great circle of the retina, and by the other to the crystalline lens.

The retina terminates by a distinctly formed circle, which is a little strengthened at the circumference of the *corona ciliaris*, and at that of the zone. The plane of the retina is continued with that of the corona; the zone is placed more posteriorly than the retina. Its external part, which rests upon the vitreous humour, is nearly horizontal, and its internal part becomes straight again in order to be attached to the crystalline lens. It does not adhere to the membrane of the vitreous humour when the chick is but little advanced. It remains often placed upon that membrane without being attached to it, and when the chick is more formed, or after incubation is finished, it quits the membrane of the vitreous humour, in order to remain connected to the *corona ciliaris*, with which it becomes inseparably united in the end.

The circumference of the ciliary zone, in the latter days of incubation, can be separated from the membrane of the vitreous

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vitreous humour without leaving any shreds. It is distinguished from the retina by its fineness and being separable from the latter without being torn; but it is continued with the posterior and inferior part of that membrane. It differs still more from the membrane of the vitreous humour; it is thicker, it has more brown and less blue in its colour. Acids, when applied to it, affect its colour more than they do that of the vitreous membrane. It is situated anteriorly upon that membrane, in another plane, and evidently sustained by it, and consequently ought not to be confounded with it.

The canal of Petit does not exist. The membrane of the vitreous humour proceeds, without stopping behind the ciliary zone to be attached to the crystalline lens, that it sustains, and which remains in its place even when the corona ciliaris has been raised.

The ciliary zone is easy to prepare even in the chick but little advanced. One method is to cut off the cornea and iris; and having washed away the black pigment with which the corona ciliaris is covered, it will appear between the intervals of the ciliary rays; and if some of those rays be elevated, it will be seen in its proper place. It is practicable to make the lens come forth from its depression, and to elevate it with the corona ciliaris, with which it is connected; and sometimes it may be possible to leave the zone resting upon the membrane of the vitreous humour.

An easier mode of preparation is to cut the sclerotic coat through the middle, and to plunge the anterior half of the eye into vinegar. After some hours immersion in that fluid, if the back of a fine scalpel be insinuated between the retina and the choroid coat, and the vitreous and crystalline humours be removed, one sometimes succeeds in obtaining the ciliary zone alone, the corona remaining attached to the choroid. It is rare to have the zone entire, but a considerable part of it is commonly preserved, and particularly the whole of the external circle. When the experiment fails, it is the interior circle which remains attached to the corona.

In the above account of the ciliary zone and crown, we have anticipated many facts that are observable during the last days of incubation, and even after that process terminates, in order to render the history of those parts more intelligible. We have also been induced to borrow the preceding description from Haller, who made the structure of the ciliary zone and crown in the chick a particular subject of investigation, as we have not much attended to the progress of the eye during incubation. See Mem. sur la Format. du Cœur dans le Poulet, sur l'Œil, &c. Observ. 180, 181, 182, 191, 192, 193, 215, 216, 226, 228, 231, 239, 240, 247, 249, 253, 254, 256, 261, 262, &c. and sect. xii. Mem. second par M. Haller. The *small tubercle*, from whence the aorta and pulmonary arteries arise, and which appears to have been a remnant of the bulb of the aorta, entirely disappears about the present period.

The *right ventricle* of the heart is still about the one-fourth of its length shorter than the left.

Those *bones* of the chick, according to Haller's observations, which are now formed, are merely in a cartilaginous state; even the *cranium*, which was apparent some time before the present.

The *umbilical opening*, through which the urachus and the blood-vessels communicate with the interior of the body of the chick, forms a projection, or a sort of tube, which in a few days becomes more striking. Some of the convolutions of the intestines may be seen in this opening, but the greatest part of the intestines is contained in the body of the fœtus.

The *end of the 11th day, or 264 hours*, the external membrane goes on strengthening, by its connection with the *vesicu-*

la umbilicalis. This last is now so extensively united to the external membrane and the amnios, that it is only by great care, and after being macerated in spirits, that it can be liberated from its connections, and exposed as a distinct bag, pendend from the umbilicus. When thus separated by dissection, it is seen to be a large sac, composed of a thick fleshy membrane and hardly containing any fluid. The strength of the bag appears to depend upon a reflection of some of the other membranes covering and being inseparably adherent to it, for at the umbilicus the vesicula is thin. Haller traced the urachus from the vesicula to the rectum after the present period, and even until the last day of incubation; but in our observations it has appeared that the connection of the vesicula with the chick, except by means of the blood-vessels, after this time, is very obscure.

The whole of the body of the chick is now seen to be covered with *feathers*.

Haller at this period first discovered the *tongue*.

The substance of the *brain* is still found to be a very soft pulp.

The *liver*, in most instances, has a yellow colour, but in some the red predominates.

Bile is evidently secreted: the *gall-bag* is green, and a greenish or yellow fluid is commonly found in the stomach. The intestines likewise appear to contain bile, or at least a bitter fluid.

The *renal capsules* are evident; they have, according to Haller, the form of an S.

The tube or sheath which projects at the umbilicus is better formed.

The *blood-vessels*, which come out at this place, are easily traced from different sources. Those which are distributed to the external membrane and vesicula come from the loins, and those belonging to the yolk-bag are from the abdomen.

The *end of the 12th day, or 288 hours*, the chick has more of the figure of the adult bird than at any preceding period. The extremities are larger, and the head smaller, in proportion to the rest of the body. The bill is more pointed, and of a harder substance.

The *stomach* has gained greater strength; it contains a white coagulated or curd-like substance.

There is *bile* found in all the intestines, which is very bitter.

On the outside of the umbilical sheath there are some folds of the intestines, with one of which the yolk-bag is seen to be connected by a short process, which is evidently the continuation of the alimentary canal into the yolk-bag. This part has commonly, and as we shall hereafter see very deservedly, received the name of *ductus vitello-intestinalis*. Although we have not observed the duct before the present date, there is every reason to suppose that it is coeval with the intestines.

Malpighi states that he saw the *stomach* of the chick on the outside of the umbilical sheath: but this would seem to be an error. The stomach, it is true, is situated low down in the belly, but, as far as our observation goes, it never is protruded from that cavity.

The structure of the *eye* is the same that is described on the 11th day. It is proper to remark, that at no period is there to be found in the chick a *membrana pupillaris*.

The *yolk-bag*, according to our observations, begins in general to alter its figure. Before this date it was an irregularly round mass, containing two depressions; one for accommodating the chick and amnios at the upper side, and another at the lower part of the yolk, in which the white is partially lodged. The latter is a regular depression, and before this period contracts in breadth, although it becomes somewhat greater

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greater in depth; an alteration which arises from the diminution of the white, and from the chalazæ tending to approach each other, and thereby to bring the two poles of the yolk, at which these bodies were originally attached, together on the lower surface of the yolk. The approximation of the chalazæ seems likewise to occasion, in the first instance, the division of the yolk-bag into lobes. At the present period the bag forms two lobes, one large and one small. These afterwards, by the compression of the chick, are usually moulded into three, but in the egg of some other birds into a greater number: thus the yolk-bag in the *Guinea fowl* is divided into six or seven lobes.

The End of the 13th Day, or 312 Hours.—Upon opening an egg at this period, and removing the contents from the shell, the *white* is found to have assumed a greenish hue, and to have more consistence than at any of the former periods; and it is inclosed entirely by a fine film, which retains it in one position, and in strict connection with the depression on the inferior surface of the yolk-bag. The external vessels are distributed over the whole white.

The *yolk-bag* has still more of the lobulated figure, and the chick lies obliquely across the bag in the superior depression between the two lobes.

The *valvular* structure on the internal surface of the yolk-bag, which we have noticed before, has now arrived at perfection. The valves are more eminent, form numerous folds or coils, their edges appear to be covered by tubes which are convoluted upon themselves in the manner of intestines. These have been called by Haller the *vermiform* and *intestineform tubes*, and have been described both by him and other anatomists as real vessels: but they have always appeared, in our examinations, as reflections or processes of the valvular structure, in the substance of which the real blood-vessels ramify. Maitre Jan speaks of them as vessels which collect the fluid of the yolk, and which afterwards terminate in the blood-vessels. Haller considers the blood-vessels which run in the edge of the valves as a distinct order of vessels, that end in the trunks of the veins of the yolk-bag, and which take their origin at the circle, that exists in the latter days of incubation around the line where the yolk and white are joined to each other. We have already said that the vessels upon the edges of the valves have numerous communications with those that run along the roots or bases of the valves, and which belong to the external tunic of the yolk-bag, and were originally the same vessels that formed the vascular area. The venous circle of the yolk-bag, we have no doubt, is the same that in the early stages of incubation has been described as the contour of the vascular area: and the vermiform tubes appear to be the villous or spongy processes of the external surface of the yolk-bag, which appeared in the first days greatly extended, and grown into the form now described.

The *chick*, at the present period, has still more of its perfect form; its head is much curved, and the bill is placed under the wing, which position is preserved throughout incubation.

The *bill* is pointed and has its natural figure. Haller states, that the chick is often perceived to open and shut the bill about this period and afterwards. Maitre Jan, on the contrary, although the chick moves its limbs frequently and strongly, asserts, that it does not open its mouth. We have not attended to this circumstance, from considering it of little consequence, and no way explaining the mode in which the chick is nourished.

The *internal organs* of the *chick* are considerably advanced towards perfection. The *brain*, although still soft and pulpy, is well formed. The *kidneys* and *testes* are completed in their

figure. The *spleen* resembles a conglobate gland. The *lungs* are of greater size than the heart.

The first branch that the aorta gives after its exit from the heart is the *left carotid*, which gives off the *subclavian artery* of that side. The trunk of the aorta then forms an arch, which turns to the right. It sends off the *right carotid*, and approaches the vertebræ in passing behind the right lung: it is united to the ductus arteriosus above the liver.

The right ventricle of the heart is still shorter than the left; it is of an oval figure, but the latter ends in a point.

The end of the 14th day, or 336 hours, the changes in the humours and the formation of the organs of the chick are found to have made progress since the preceding day.

We have already stated that the membrane which is external to the chick and the yolk-bag, and which is scarcely palpable in the first days of incubation, gains strength and receives vessels after the vesicula umbilicalis has acquired some size, and has adhered to it. The magnitude of the vessels, and the thickness of this membrane, increase in proportion as the vesicula umbilicalis grows: we therefore conceive that the development of this membrane depends upon its connection with the vesicula and the blood-vessels which it derives from that bag. We have observed, that some days before the present period, the external membrane begins to extend over the white, which it usually encloses about the 14th day: it therefore forms a perfect sac, containing the chick in its amnios, the yolk-bag, and the white.

The vesicula umbilicalis about this period has arrived at a very great size; its extent cannot be easily ascertained, as it is so much incorporated with the external membrane, that they cannot be separated or accurately distinguished: but we should conceive that the vesicula exceeds in size the yolk-bag, as there is the appearance of the external membrane being thickened and strengthened by one under it as far as the yolk extends.

The manner in which the vesicula concurs to form a membrane which invests all the contents of the egg, appears to be similar to the reflection of the serous membranes of the thorax and abdomen, in order to cover the viscera and line the parietes of these cavities. It should however be observed, that when it is opened, there is no appearance of its forming an immediate tunic similar to the pleura pulmonalis, but it seems to be a simple bag, holding the contents of the egg, and only united to them by some reflections of very fine membrane, which are chiefly attached to the back of the amnios, and in the course of the trunks of the blood-vessels. This circumstance has embarrassed other observers, and has led many to overlook the share that the vesicula umbilicalis has in the formation of the common membrane of the parts of the egg.

The *blood-vessels* which are distributed to the external membrane are, even at the present period, much larger than those of the yolk-bag. There are four long branches, which send out numerous ramifications, that become so minute as to evade the sight; but when this membrane is viewed with a magnifying glass, it presents a beautiful spectacle. The situation of the four great branches is not constantly the same; as they are dispersed upon a loose membrane, which varies in some degree its position according to circumstances: one of them, if not two, is always seen, however, to cross the back of the amnios. The four branches are arteries, and are formed immediately on the outside of the umbilicus of the chick from the two iliac arteries; they, therefore, correspond to the *umbilical arteries* of mammiferous animals. The left iliac artery is always of much greater size than the right; it even appears larger than the aorta, of which it is the termination.

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nation. The right iliac artery is often a mere filament, and in some instances it seems to be wanting altogether.

The *venous branches* which accompany the umbilical arteries are so small that they are hardly distinguishable, although the former are of sufficient magnitude to be injected, and have a visible pulsation. There is, therefore, a quantity of blood sent to this membrane which is not returned to the fœtus. The colour of the blood, both in the umbilical arteries and veins, is a purple.

The vascular membrane, above described, has received different names. By the older anatomists it was usually called the *chorion*, to which perhaps it is most analogous. Haller gave it the name of the *umbilical membrane*, and Leveille has lately called it the *bag-shaped membrane* (*membrane saciforme*), from the circumstance of its enveloping all the parts of the egg. We have hitherto called it the *external membrane*, until it should be described; but hereafter we shall speak of it as the *chorion*. In the account of the unincubated egg, the membrane, on which the shell is moulded, is called the external, which it strictly is. It should not be confounded with the chorion, from which it differs so much in figure, structure, and use. See Egg.

Haller appears to have not distinguished the chorion from the membrane of the yolk-bag, which contains the vascular area. The progress of these two membranes is exceedingly different, and the system of vessels belonging to each is perfectly distinct. The valvular area is confined to the surface of the yolk-bag, and is intimately connected with its membranes, and the valvular apparatus already described. The vessels of the area are chiefly venous, and are formed independently of the heart of the chick. They are most numerous in the early periods of incubation, although they increase in size along with the other parts of the chick. They go to terminate in a large vein which proceeds directly to the auricle of the heart in the first days, but, after the liver appears, is seen to pass behind it, and when the intestines are formed is found upon the mesentery, and constitutes the largest branch of the vena portæ.

The arteries of the vascular area are insignificant, until towards the end of incubation. When first perceived, they are given off from the dorsal aorta, and after the development of the intestines they are discovered to be branches of the mesenteric artery. The vessels distributed to the area appear, therefore, analogous to the omphalo-mesenteric arteries of quadrupeds, although their destination and functions may differ.

The *vessels* of the *chorion*, as we have already said, are branches, or rather, in the fetal state, the trunks of the iliacs extended upon this membrane. They do not exist previous to the appearance of the vesicula umbilicalis, with the growth of which they keep pace. The arteries of the chorion exceed the size of its veins in the same proportion as the veins of the yolk-bag exceed the arteries of that part. The vascular area, therefore, collects and transmits the blood to the fœtus, while the arteries of the chorion dispose of a great portion of it in an extraneous circulation, and in the formation of a thick and extensive membrane.

Haller and others have described, at this date, an appearance of white vessels upon the albumen. Maitre Jan reckons seven of these white lines or vessels. They arise from a little circle which is in the centre of the white; they divide into branches in advancing towards the vascular circle of the yolk-bag, which forms at this time the boundary of the septum between the yolk and the white. Maitre Jan describes them as passing beyond the septum and extending to the yolk. Haller conjectures that the use of these vessels may

be to absorb the white and convey it into the yolk. Observ. 226. Mem. 1.

We have not made such an examination of these white lines, as to enable us to pronounce whether they are vessels or not, or what their use may be.

The *water* of the *amnios* appears to diminish about this period of incubation. It also becomes gradually less pure. It is stated by Maitre Jan, that when the fluid of the amnios is boiled at this date, the greater portion of it acquires the hardness that the white of the egg possesses after being boiled, although previous to the experiment it is much more fluid than the albumen; from whence Maitre Jan conjectures that some of the fluid of the white is conveyed into the sac of the amnios, but he does not pretend to explain the means by which this is effected.

The *curd-like substance*, already mentioned as being found in the stomach and intestines, is now met with also in the crop and œsophagus. According to Haller, boiling water makes this substance hard in the same manner as it does the white of an egg.

The end of 15 days, or 360 hours, the membrane of the chorion continues to increase in strength, and its arteries in size. Haller speaks of having sometimes found the latter of a lighter red than the veins, which does not accord with our observations. We have generally perceived the arteries and veins to be similar in colour, or at least when a difference did exist it was immaterial, and sometimes the arteries, and sometimes the veins were the lighter coloured vessels. The vessels of the chorion have always appeared darker in our observations than those of the yolk-bag, but the character of all the blood is venous in the incubated egg during the latter periods. The reflections of membrane which accompany the principal vessels of the chorion, are now more firm than before, and continuous with them appears a fine transparent membrane that envelopes the yolk as far as the vascular circle on the edge of the white, and extends over part of the amnios, to which membrane it adheres, so as to cover an irregular triangular portion of the chick in its amnios, and inclose more loosely the umbilical sheath with the convolutions of the intestines which project from it and the neck of the yolk-bag. This membrane does not appear to have been well understood by the older anatomists.

They sometimes speak of it as a layer of the yolk-bag, and at others as the vesicula umbilicalis, or allantois. The best description of it has been given by Leveille, who has also named it very appropriately *entero-clorilymie*, or the *membrane containing both intestines and yolk*.

The origin of this membrane is still involved in a degree of obscurity. Leveille described it when perfectly formed, but has thrown no light upon the history of its growth. The present date is the first at which it has appeared to us to be perfected, but we conceive that it is one of the original membranes and the second layer, that in the first days comes off the vascular area as a very fine pellicle. It seems to be connected, or rather continued into the peritoneum, lining the abdomen in the late periods of incubation, of which we shall see farther proofs hereafter. There is no reason for supposing this membrane to be the vesicula umbilicalis, or allantois, as the vesicula is a stronger membrane in the middle of incubation than this membrane is several days afterwards, when it is completely formed. The proper contents of the allantois also are found, throughout incubation, within the cavity of the chorion, to the formation of which we have supposed that bag contributes, but never under the membrane that incloses the intestine and yolk-bag.

Haller states that he examined the *valves* upon the inner surface of the yolk-bag with a lens, and distinctly saw the *intestineform*

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intestineiform tubes upon the edges of the valves most beautifully curled and folded upon themselves. He failed to see the aperture of these tubes. By maceration in water they were detached from the valves, and swam in the water. The valves themselves, by a longer maceration, were also separated.

The *chick* increases regularly in size, though not so rapidly as during the early part of incubation. Haller observed the feathers upon the *eye-lids* at this period, and that the *spleen* had acquired the figure it preserves through life.

The *curdy*, or *coagulated substance* is now found in the *oesophagus* and the *crop*, as well as in the *stomach* and *intestines*. Harvey found this substance principally in the *stomach*: this appears to be the case, and when met with in other places, it would seem to have proceeded from the *stomach* to them.

The *end of 16 days, or 384 hours*, the space between the two layers of the membrane lining the shell, for containing air, is much increased since the period at which we have last mentioned it. About one-sixth of the whole cavity of the egg is occupied by air.

* This circumstance depends upon the diminution of the substance of the white, which is at present reduced to a very small size.

The texture of the *white* continues to become firmer.

Upon removing the *chorion*, which now completely encloses the white, that humour is found to possess a thin tunic, which is proper to it. This membrane is evidently of a late growth, and appears to be formed by the vessels of the *yolk-bag* extending beyond the *septum*, or that portion of the bag which is bounded by the *vascular circle*, and which is in contact with the white.

The fluid of the *amnios* is somewhat diminished.

The *yolk-bag* in the egg of the hen is generally formed into three lobules, although many authors speak only of two lobes at this time; one, which is the most distinct, but the smallest, lies upon the side of the body of the chick, between the head and the thigh: the two others are placed at the two ends of the chick.

Maitre Jan describes the *yolk-bag* as being formed only into two lobes, but ready to enter the abdomen, of which he gives a figure at this period, and of a fissure that ascends from the umbilicus, between the two recti muscles of the belly of the chick. He likewise describes the *ductus vitello-intestinalis* for the first time, which, with the *yolk-bag*, he succeeded in inflating from the crop of the chick; and he says this part is not to be demonstrated at an earlier period than the end of the 16th day, on account of its extreme tenderness; but, as already mentioned, we have found the duct on the 13th day.

Haller found the intestines before this period to be irritable. When stimulated, they contracted into knots.

The blood-vessels of the *yolk-bag* appear fewer and smaller, owing, in part, to their being so much more involved in the valvular coat than they were in the middle periods of incubation. The branches of the blood-vessels of the *yolk-bag* are larger than the trunks, and the veins are still vastly greater than the arteries. Haller states that the vein going upon one of the valves, is a larger vessel than the trunk, from whence all the arteries of the *yolk-bag* take their origin.

The *End of 17 Days, or 408 Hours*—Haller admits the appearance of three lobes of the *yolk* at this date, which we have seen before.

The *arteries* of the *chorion* are extremely large; we have succeeded in introducing a pipe into them, and injecting them with coloured size, which makes a beautiful preparation. Haller, in his observation of this date, found both

the *arteries* and *veins* of the *chorion* to be a purple colour, and the veins more violet than the arteries.

It now appears that there are two series of vessels belonging to the *yolk-bag*. The branches, which are spread upon the external membrane of the bag, appear to be the same which formed the *vascular area* in the early periods of incubation. The vessels of the internal coat are distributed to the valves. Both series contribute to the *vascular circle*, which, as we have before stated, is the remains of the vein that formed the contour of the *vascular area*. Maitre Jan says there are several layers of the membrane which contains the *yolk*, but it is probable that he mistook for one that membrane which incloses the *yolk-bag*, the intestines, and a part of the chick.

Coiter has found the *yolk-bag* within the belly of the chick at the 17th day; but the ingurgitation of the *yolk* is a later event, according to the observation of other writers.

There is now a circular arrangement of muscular fibres around the opening into the belly of the chick at the umbilicus. This sphincter was not apparent before, and, as we shall soon find, is a very essential structure in the last periods of incubation.

If the *yolk-bag* be opened, and the valvular membranes cleaned by frequent ablution and floated in clear water, the sides of the valves will be found to be perforated by a great number of foramina, so as to give the valves the appearance of lace. The intestineiform tubes also upon the edges of the valves will be partially detached; the portions that remain resemble pieces of cylindric tubes.

Many of the blood-vessels upon the external surface of the *yolk-bag* contain apparently but little blood, and have a greenish colour, as if conveying a yellow or green fluid.

The *End of the 18th Day, or 432 Hours*.—The two layers of the external membrane, which immediately lines the shell, are separate for about one-third of their extent, and can with little pains be detached from each other until near the small end of the egg. The quantity of air contained between these layers, although much increased, is less than might be supposed, as the layers are not far asunder, except at the great end of the egg.

The *water* of the *amnios* is a good deal diminished, and its membrane is applied in folds to the surface of the chick.

The *chorion* has attained a very considerable strength, admitting of examination and dissection, without being previously hardened by spirits or vinegar. When this membrane is laid open, there is some tough lymphous substance found under it in layers or streaks, which has been mistaken for a membrane by some anatomists. There is generally mixed with this substance a certain quantity of calcareous matter. It has, therefore, been supposed to be a kind of excrement, or the secretion of the kidneys. These white flakes are what have been called *striae reticulatae urinae* by Malpighi, and were described by him as being found in the allantois.

When the *chorion* is opened and turned down off the contents of the egg, it appears to be a distinct bag, and only connected to the other parts by reflections of fine membrane. These are chiefly in the course of the trunks of its blood-vessels, and at the junction of the *yolk* and white.

The *yolk-bag* is now often found gathered into more lobules than three, some of which have entered the abdomen of the chick, through the aperture at the umbilicus. The forming of the *yolk-bag* into lobes and lobules, appears to be owing to the contraction of the membrane that contains it, and the intestines of the chick; for, when the *yolk-bag* is taken out of this membrane, it spreads out into nearly its original figure, except that there is a marked depression where the white is joined with it, and that the neck of the bag is somewhat elongated.

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gated. It seems likewise to be the contraction of the same membrane which urges the yolk-bag into the cavity of the abdomen of the chick.

The yolk appears to be somewhat less than in the preceding days; but on the closest examination we have not been able to discover any of it in the intestinal canal. We have observed at this period, although it probably exists much sooner, an appearance of yellow vessels accompanying on each side the blood-vessels of the yolk in the same manner as the small veins generally attend arteries. We have not been able to determine whether this appearance be caused by real vessels filled with a yellow fluid, or by the inner coat of the bag being seen through the outer, producing on the edge of the tract of the real blood-vessels an appearance of yellow lines.

The chick has now attained nearly the utmost size that it will possess while in the egg. Its form is entirely that of the excluded chick, except that its abdomen is enlarged in proportion to the quantity of the yolk-bag which is admitted into that cavity.

The different organs of the chick are very perfect. The convolutions of the *intestines* which were outside are taken into the belly with a portion of the yolk-bag, as before mentioned. Maitre Jan states that he found about this period the *tympanum* and the *labyrinth* of the ear hard, and nearly of their full size. All the bones have acquired osseous matter and considerable hardness.

The bile contained in the gall-bag is an intense green, and gives that bag a blue colour.

The end of the 19th day, or 456 hours, the air-cell extends round one-half of the cavity of the egg.

The amnios is in some instances found to be ruptured by the bill of the chick.

According to Haller, the chick begins to cry about this period. Harvey and Langly also heard the piping of the chick at this date. Some other authors have not noticed the chick to cry until the twentieth day, which agrees with our observations. Still, however, the time at which the chick begins to cry is subject to vary, according to the degree of heat to which it is exposed. Thus, in an egg from which no sound issues while it is in the nest, if placed upon warm water the piping of the chick will be heard.

The chorion begins to appear a little faded, the circulation of blood upon the membrane being carried on more sluggishly. This change seems to be preparatory to the destruction of that membrane which is about to happen.

More than two-thirds of the yolk-bag and its contents have been received into the abdomen. If that cavity be opened, it will be seen that the bag is pressed in amongst the different viscera, to which its figure is capable of being perfectly accommodated in consequence of its folds and lobules.

The white is reduced to a few irregular-shaped knots, which generally contain some calcareous matter that appear to remain after all the liquid parts of the albumen have been removed. The knots are composed of the chalazæ, and the membrane of the white compressed together.

Maitre Jan very readily succeeded in distending the yolk-bag and the ductus vitello-intestinalis, by blowing air into the œsophagus, but did not yet perceive that any of the yolk had passed through the duct into the intestine.

Haller describes at this date the effects produced upon the valvular structure of the yolk-bag by maceration in water for some days.

Having first washed the sac containing the yolk with several waters, he found the edges of the valves covered with the vermiform tubes before described, which separate and

form curves; these elongate and expose the interval of their two curvatures. They break at the end, and the two ends become nearly straight, remaining attached to the edge of the valve. The breadth of these little membranes appears also covered with cylindric tubes, sometimes branched and separated by the reticular intervals. The day after, the yolk-bag having been steeped in water, he saw the appearance of cylindric tubes forming a net-work upon the membrane which makes the breadth of the valves, and continuous with the vermiform tubes of the edges. He further saw that the vessels of the valves, having arrived there, were covered with some very fine small tubes resembling a powder. The following morning, he saw some of the tubes which ascended from the base of the valves, and which were continued with the tubes of the edge. They were cylindric as far as he could perceive, and joined in form of a net-work. The straight vessels went evidently as far as the vascular circle of the yolk-bag.

The fourth day many of the tubes had disappeared, and there only remained on the edge of the valves the membrane which covered the trunk of the vessel. With respect to the nature of the tubes on the sides of the valves, he found it difficult to pronounce with certainty. By examination with a strong lens he perceived that there were some real tubes upon the sides of the valves, which ascended in a serpentine manner; but those which are the most numerous, and which form the net-work on the breadth of the valves, were not determined to be tubes, although they are most probably so, as they appear cylindric under every point of view, and are continuous with the tubes of the edge.

The fifth day, the vessels of the edge appeared all uncovered: these vessels preserved some breadth, and a round figure at the edge, and an undulating course. It was more easy to distinguish the real vessels which descend from the edge in a serpentine manner, and traverse obliquely the breadth of the membrane, in order to return into the plain between the valves. Haller also saw very evidently some branches which proceed from the vessels between the valves, and which ascend in a serpentine manner by the side of the valves, and communicate with the trunk which runs along the edge. The remainder of the valve was become an open net-work of extreme beauty.

The sixth day many of the valves had disappeared, and others presented only a plaited border, like a mesentery, from which the intestines had been removed. Mem. i. p. 379.

The chick at the present date is about the size that it is immediately after exclusion from the shell. It lies coiled round with its head under the right wing.

The blood-vessels in the interior of the chick have attained more of their proper size in proportion to the parts they supply. The left branch of the aorta, however, which forms the principal umbilical artery, is still nearly equal in magnitude to the aorta itself.

Haller observed at this period the *vena cava* beat between the lobes of the liver.

The end of the 20th day, or 480 hours, the shell is extremely dry, and very fragile, which is occasioned by the more extensive detachment of the membrane which is immediately under it. The brittleness of the shell is a very convenient circumstance at this period, when it is about to be ruptured by the efforts of the chick.

It is usual at the present date to find the greater number of the eggs in a hen's nest cracked or chipped near the great end. This is attributed by common people to the parent, who is supposed, by a particular instinct, to know the proper period for the liberation of the young chick. Malpighi likewise

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supposed that the shell was broken by the hen, in which opinion Haller seems to concur. He states that he found a fissure in the shell, and the membranes which inclosed the chick, at the same time entire. Maitre Jan, on the contrary, ascribes the fracture of the shell to the chick. He found the beak had lacerated the membranes before the shell was broken; and having watched the eggs at the time the chicks began to cry, he did not perceive the hen touch them with her bill, but that the shell was ruptured from the inside, and the fractured portions were pushed outwards. This account of the mode in which the shell is opened, exactly accords with our observations. We have seen the shell evidently broken from within; besides, the fact of birds being hatched by artificial heat, proves decidedly, that the assistance of the hen is not necessary for the fracture of the egg.

After the shell is broken the chick is always heard to cry, and the point of its beak is seen to project out of the egg for several hours before the chick attempts its liberation.

It is reported by common people who have the care of sitting hens, and it is even asserted by some anatomists, that the cries of the chick are heard before there is any aperture made in the shell. Haller relates that he took an egg, in which he discovered the piping of the chick, and which was at the same time unbroken, and having carefully removed the shell, piece by piece, he found that the opaque membrane, which lines the shell, was also entire, but that there was an opening in the chorion opposite to the beak of the chick. He does not state whether the bill had penetrated into the air-cell, but it most probably did, as at this period the two layers of the membrane lining the shell are separated beyond the situation of the beak of the chick. In another observation Haller found the chorion entire under the fissure in the shell, which was on the opposite side of the egg to the bill of the chick; and therefore he supposes the shell to have been cracked by the hen. We cannot positively contradict the assertion of the chick uttering sound before it has the means of freely respiring, but we should conceive it extremely improbable; and upon every occasion where we have heard the piping of the chick issue from the egg, we have found that there was a crack or fracture in the shell.

Where the chorion is lacerated by the beak of the chick there is always some blood shed, but the edges of the membrane soon dry, which prevents any farther hæmorrhage; for the circulation is not yet interrupted in the chorion by the contraction of the sphincter at the umbilicus, although Maitre Jan describes the passage of the yolk, and the destruction of the chorion, as events of the same date.

When incubation has proceeded regularly, the whole of the yolk-bag at this period is found within the cavity of the abdomen, which is closed by the contraction of the circular fasciculus, of muscular fibres placed around the umbilicus; but, as already mentioned, this does not, until near the exclusion of the chick, compress the umbilical vessels, so as to destroy their circulation.

The ingurgitation of the yolk causes a great tumefaction of the belly of the chick. The animal resembles one in a gravid state, but the belly is less swollen than might have been supposed from the bulk of the yolk-bag. The latter does not lie in the front of the cavity, but is pressed in between all the viscera, and therefore occupies the least possible space.

It is remarked by Maitre Jan, that more chicks die about this period than at any other of incubation, which he attributes to the distention of the abdomen by the yolk-bag; but we should suppose that it is the cessation of the external circulation upon the membrane of the chorion, which causes the great fatality towards the end of incubation.

Maitre Jan states that he discovered the fluid of the yolk at the 48th hour mixed with the contents of the small intestines; but some other anatomists, who admit the passage of the yolk through the ductus vitello intestinalis, do not pretend to have detected it in the intestine so early.

The chick, about this period, is sometimes observed to remain for a while perfectly motionless. Harvey supposed that it was asleep on these occasions. How far he was correct we cannot pretend to say.

According to Haller the weight of the yolk is not sensibly diminished before its entrance into the belly of the chick. He weighed the entire yolk-bag at the 500th hour, and found it to be three drachms and two grains. He states that the weight of the yolk, before incubation, was three drachms and ten grains. This diminution of weight is, therefore, not greater than might have been expected from evaporation, or from an original difference in the bulk of the two eggs that were the subjects of the experiment.

Haller, in seeking for the *allantois*, or *vesicula umbilicalis*, at this period, states, that he could not distinguish it from the chorion, or rather from a fine membrane he raised from the internal surface of the chorion by inflation; but he found a little sac in the form of a pear, extremely vascular, full of a yellow mucus, and terminated by a peduncle which was not an inch long. We have already described the *vesicula umbilicalis* as being lost in the formation of the chorion long before the present period. Malpighi, likewise, supposed this part to have the same destination in the latter periods of incubation: and in none of our observations have we met with the pear-shaped bag mentioned by Haller. We have turned back the chorion at the present date, and have found it to be a perfect sac, such as we have previously described it, and connected with the adjoining membranes by reflections of a very delicate texture. These were readily detached, and left the chorion pendent by its vessels from the umbilicus of the chick. Besides the blood-vessels, we could discover a transparent filament passing to the inverted bag, which appeared to be tubular, and perhaps was the urachus.

The End of 21 Days, or the full Period of the Incubation of the Hen.—When the progress of incubation has been regular, the chicks are now generally found to have abandoned the eggs, leaving the shells with the shreds of the chorion and amnios behind them. It happens, however, occasionally, that some of the chicks have been backward in their growth, from the unfavourable position of the eggs in the nest, or the negligence of the hen. These are sometimes found about this period within the broken shell, having the remains of the membranes still attached to the umbilicus.

The separation of the membranes does not appear to be effected by a process of slough or of ulceration. They appear rather to be torn off, as some shreds and a short portion of the trunks of the blood-vessels are seen to project at the umbilicus. The hæmorrhage from these vessels also is not entirely suppressed by the constriction of the sphincter muscle, but in a degree by the assistance of a clot of blood, which forms in the ends of the torn vessels.

We have not been able to observe whether the complete fracture of the shell, previous to the exclusion of the chick, and the detachment of the membranes, are accomplished by the efforts of the chick alone, or with the assistance of the hen.

The belly of the chick, after exclusion, is much enlarged, though less tumid than it was when the yolk-bag was first taken into the abdomen. It would, therefore, appear that the yolk begins to diminish immediately after it is admitted into the belly of the chick, although some observations of

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Haller would lead to a different conclusion. He weighed the egg and its different contents at the 526th hour, and found the entire egg to be 13 drachms and as many grains; the weight of the yolk, with some light membranes that adhered to it, was four drachms. The fœtus weighed five drachms and 14 grains. In an egg which had not been fat upon, he found the weight of the entire egg to be 10 drachms and three-sixths, and that of the yolk three drachms and 10 grains. This account of the weight is obviously incorrect. See EGG.

Many anatomists state that they have been able to detect the fluid of the yolk in the intestines at this period, and some supposed that they found it had passed into the alimentary canal, even before the exclusion of the chick. Haller found yolk in the intestines at the end of the 21st day, in one instance where the chick had not left the egg. Maitre Jan saw it after 20 days and six hours. Needham describes the gradual passage of the yolk into the intestine at the end of incubation. Langly also found it in the intestine at the same time. Theod. Aldes states that before the chick was excluded, he could not press the substance of the yolk into the gut, but that immediately afterwards he was able to do so. Stenon succeeded in pressing the yolk through the ductus vitello intestinalis.

Notwithstanding the testimony of so many anatomists, we are inclined to believe, that the substance of the yolk is not conveyed into the intestine. We have scrupulously examined the intestines of chicks, both before and after the exclusion from the egg, and in no instance could we discover with certainty any yolk in them. In the last periods of incubation, and until the chick has taken its natural food into the stomach, the alimentary canal is filled with a yellow fluid, which it is scarcely possible to distinguish from the yolk; therefore, all direct observations respecting the passage of the yolk into the intestines must be attended with a degree of doubt. There are, nevertheless, many reasons besides actual examination; for supposing that the yolk is not conveyed into the system of the chick by passing first into the intestinal canal, which we shall state in speaking of the uses of the different parts of the egg, we are further supported in our opinion by the authority of Blumenbach, who asserts positively, that the yolk does not pass into the intestine. We might also quote the same opinion held by Leveille; but he advances it upon false grounds, as he describes the ductus vitello intestinalis as a ligament, by which the yolk-bag is suspended to the body of the chick, notwithstanding the tubular structure of this part is so palpable.

The substance of the yolk at the end of incubation is extremely tenacious or gluey in its consistence, and of a deep green colour, particularly in the centre.

The net-work of the valves upon the inner membrane is very visible at this period. We have thrown coloured size into the blood-vessels of the yolk, and afterwards softened by maceration, and by frequent ablution detached the inner membrane; when we found that the basis of the lace-like or reticulated structure of the valves was formed by real blood-vessels, which presented the most beautiful vascular apparatus that we have ever seen. This mode of preparation shews, that the organization of the internal membrane depends upon the growth of the blood-vessels of the external membrane of the yolk-bag, and confirms the account we have already given of the formation of the valves. Haller considered the vessels distributed in the valvular structure of the bag as being chiefly, if not entirely, venous; but we found them most easily injected from the aorta of the chick. In the early periods of incubation we know that the branches

of the veins of the yolk-bag are larger and more numerous than those of the arteries, but we are inclined to believe the arterial branches predominate towards the end of incubation. Further observations, however, are necessary to explain the vascular system of this membrane.

Several anatomists speak of a new membrane being found upon the yolk-bag towards the end of incubation, which is continuous with the skin of the chick. Haller, in some observations, describes this membrane in a manner which leaves no doubt of its being the same that we have already noticed as including the yolk-bag and intestines of the chick, when they are on the outside of the body.

We, as well as others, have found the appearance of a new transparent membrane covering the yolk-bag after it has entered the abdomen of the chick. This membrane seems to be the continuation of the peritoneum. It adheres to the inside of the umbilicus, and to that point of the yolk-bag where the white and chiazæ were attached. We have not had it in our power to investigate completely the connections of the yolk-bag with the peritoneal coat of the parietes of the belly, but we believe at present that any appearance of a third tunic to the bag is derived from the peritoneum.

Haller states observations made upon the *allantois* or *vesicula umbilicalis*, even to the last day of incubation. He mentions that he found under the chorion an extremely fine membrane which was incorporated with the tissue of white filaments or streaks that we have spoken of before. He describes this membrane as giving an immediate covering to the chick: it was so tender that inflation burst it. He supposes it to be either the amnios or the allantois. In the next paragraph he says, he sought the centre of the yolk, and found the urachus there without having any connection with the allantois. He inflated it, one part of the air went out at the anus; another elevated the membranes of the rectum. He next passed an extremely fine probe into the urachus, and found an orifice on the left side, between the anus and that vesicle that the urachus produced by inflation in the rectum: the probe would not enter the plicated muscular sac, which is behind the rectum and at the side of the vagina.

This account appears to us to be very inaccurate in some points. The membrane which Haller took for the allantois was most probably that which envelopes the yolk-bag and intestines. The urachus at the periods of incubation, when it can be found, has no connection with the yolk-bag. The foramen on the left side of the anus appears to have been made by the probe, and the muscular sac he speaks of was the *burfa Fabricii*.

Changes which take place in the Structure of the Chick after Incubation.—These chiefly relate to the disappearance of the yolk, and the degeneracy of the arterial ducts, which in the fœtus conveyed the blood from the pulmonary artery into the aorta.

In two days after exclusion from the egg, the yolk is very sensibly diminished in quantity, and its consistence is even more tenacious or gluey than it was before.

The *right ductus arteriosus*, which is the first obliterated, becomes as small as a filament. The *left* is, according to Haller, diminished three times the size it had during incubation.

In four days after exclusion, the yolk is found to be reduced two-thirds of its bulk. In proportion as the substance of the yolk disappears, the membranes forming the bag also diminish. The adhesion which we have mentioned the yolk-bag to have with the internal part of the umbilicus, after its admission into the abdomen, is now undone. It would appear that this attachment is produced by the contraction

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traction of the sphincter muscle upon the remnant of the vessels and of the membranes connected with the centre of the yolk-bag.

It is now particularly easy to see the origin and course of the proper *blood-vessels* of the yolk. The *veins* belong to a single trunk, which is continued along the mesentery, and ends in the vena portæ; it is evidently a branch of the mesenteric vein. The *arteries* are also derived from a single trunk, which is the principal branch of the mesenteric artery. This trunk, in some points of view, appears to be double; it divides, passes on each side of the intestine, and then unites to form a single vessel previous to its distribution in the membranes of the yolk-bag. These vessels, and the ductus vitello intestinalis, are connected together by some fine folds of peritoneum, which are the continuation of the mesentery.

The cavity of the *right ductus arteriosus* is completely obliterated, but the *left* is scarcely more diminished than it was on the second day.

In eight days after exclusion, the yolk is reduced to the size of a hazel nut. The *ductus vitello intestinalis* becomes thicker, and more resembles the intestine than it did before.

The valvular structure upon the internal surface of the yolk-bag is no longer apparent.

The *right ductus arteriosus*, although reduced to the size of a filament, is enlarged where it enters the aorta.

The *left duct* is likewise obliterated at its origin from the pulmonary artery; it is a filament, but is inferiorly white, opaque, and larger. Both these ducts, therefore, decline first at the superior part, where they come from the pulmonary artery.

The gizzard of the chick, especially if the animal has had the opportunity of picking up small stones with its food, is thick and muscular; and the internal coat, which during incubation was soft and spongy, is now become firm and dry.

In 16 days after exclusion, according to Haller, the substance of the yolk is entirely consumed; there remains but a small thin sac, less than a pea, containing a granular substance, which is partly of a calcareous nature, and which is the dregs of the substance of the yolk.

Twenty-seven days after exclusion, Haller found both the *right ductus arteriosus*, and the *left*, still remaining in the form of filaments. The right was smaller than the left. The latter was still open at its junction with the aorta.

In three months after exclusion, the *ductus vitello intestinalis* is found to be turned down upon the side of the intestine, to which it evidently forms an appendix. At its extremity may still be seen the remnant of the yolk-bag, reduced to nearly the size of the head of a pin. It is usually dark coloured, from the nature of its contents.

In the adult bird, Stenon, Needham, and Maitre Jan, have recognized the *ductus vitello intestinalis* in the form of a small cæcum. It is situated on the alimentary canal, about midway between the stomach and the anus.

Needham describes it as being half an inch long, but this is incorrect with respect to any of the *gallinaceous* tribe, but in some other birds we have found it of a very remarkable size.

In the *snipe* it exceeds in length the cæca of the large intestine.

In the *curlew* it is about an inch long, and very capacious.

In the *woodcock* it is nearly as large.

It is above an inch long, and very slender, in the *black*

coot: the cæca of the great intestines are also singularly long and slender in this bird.

In all the *passerine* birds it is small.

In the *swan*, *goose*, and *duck* it is of a moderate size.

It is remarkably small in the *heron* and in the *hawk*.

In all the birds we have examined, there exists during life some remnant of the yolk-bag at the end of the cæcum, formed by the ductus vitello intestinalis. This is more particularly remarkable in the *passerine* and *accipitrine* birds. The *nightingale* has a little sac, about the size of a small pea, attached to the end of this process of the intestine.

Although there is so much variety with respect to the figure and size of the cæcum of the small intestines of birds, the structure of this part is constantly the same in every species. It appears to possess but two coats; one is the continuation of the peritoneum, covering the intestine: the other corresponds to the mucous membrane of the gut. The internal surface of the cæcum exhibits small cells similar to those points of the alimentary canal on which the mucous glands are congregated. This structure exists whether the internal membrane of the intestine be plicated or villous.

We have not found the appendix produced by the ductus vitello intestinalis to receive, in any instance, the contents of the alimentary canal. It is filled with a mucous fluid, which appears to be secreted from its internal surface. There is, therefore, every reason to suppose that this appendix performs the office of a mucous gland in the adult bird. The great size which it possesses in the *snipe*, *curlew*, *woodcock*, and *coot* is probably dependent upon the nature of the food of these birds, although we cannot at present perceive in what manner this part is so particularly useful to them. See Phil. Transf. part ii. 1811.

In the *Plate* designed to illustrate the incubation of the egg, fig. 1. exhibits an egg with a portion of the shell and the membrane underneath it, removed at the great end: *a* is the first appearance of the fœtus as it is seen in the cicatrix, through the membrane which covers it; around it are the concentric circles or waves (*balones*).

Fig. 2. represents an egg opened in the same manner in order to expose the fœtus when it is a little more advanced, with the commencement of the vascular area; *a*, the fœtus somewhat formed with the head like the top of a club; *b*, the contour of the vascular area assuming the heart-shape: it does not yet circulate red blood, but within it are seen the rudiments of vessels containing a greenish fluid. Some of these points are of a darker colour, and are the first appearance of the real blood.

Fig. 3. is an egg also with the shell of the great end removed; *a* is the fœtal chick; *b* refers to the pulsating points that constitute the heart; *c* represents the appearance of the vascular area after the circulation of blood is perfected in it.

Fig. 4. exhibits a magnified view of the portion of the membranes at the great end of the egg, including the chick and vascular area about the fourth day of incubation; *a* is the thin glistening membrane which readily separates at this period from the rest, turned back; *b* is the fine transparent membrane immediately under the first, also turned a little off; *c* the chick contained in the amnios; *d* the vesicula umbilicalis attached to the chick; *e* the external membrane of the yolk-bag on which the vessels composing the vascular area are seen to spread; *f* is the internal pulpy membrane of the yolk-bag which afterwards produces the valves, the preceding membrane being partially removed to expose it.

Fig. 5. exhibits a portion of the yolk-bag with the chick and vesicula umbilicalis considerably magnified; *a* the chick; *b* the amnios; *c* the membranous connection the amnios has with

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with the *vesicula umbilicalis*; *d* the *vesicula*, the neck of which is seen to enter the opening at the umbilicus of the chick.

Fig. 6. is a magnified view of the heart of the chick as it appears when first formed; *a* indicates the horse-shoe dilatation mentioned in the description of that organ on the second day.

Fig. 7. shews the heart and large vessels of the chick magnified after these parts are more perfectly formed; *a* is the vena cava; *b* the auricle; *c* the auricular canal; *d* the single ventricle; *e* the bulb of the aorta; *f* the principal artery.

Fig. 8. is a view, also magnified, of the heart, pulmonary arteries, lungs, and aorta of the chick; *a* is the heart seen on the posterior side; *b, b*, the two arteries which send off the pulmonary arteries, and afterwards concur towards the formation of the abdominal aorta. These vessels, after parting with their branches to the lungs, are analogous to the ductus arteriosus of mammalia; *c, c*, are the pulmonary branches of the vessels last mentioned; *d* the third vessel of the heart, which corresponds to the superior part of the aorta; *e* the abdominal aorta, formed as already described; *f, f*, the two lungs.

Fig. 9. is a view of the internal surface of the yolk-bag after the valves have begun to form upon it.

Fig. 10. shews a similar view of the internal membrane of the yolk-bag, when the valvular apparatus is completely formed; *a, a, a*, indicate some of the intestiniform tubes upon the edges of the valves; *b, b*, the appearance of vessels in the intervals between the valves. The valvular projections themselves are sufficiently evident.

Fig. 11. shews a portion of one of the valves of the yolk-bag magnified; *a* the basis of the valve, where the principal vessel runs; *b* the plaits or folds upon its side; *c* the intestiniform tubes upon the edge of the valve.

Fig. 12. is a magnified view of a portion of a valve of the yolk-bag after it had been converted into a fine lace, the vessels injected, and the internal membrane washed, so that the real blood-vessels alone remain; *a* is the principal vessel that runs along the base of the valve; *b* the one which goes along the free edge; *c* the lace-like ramification of vessels between these two.

Fig. 13. represents the yolk-bag, and the portion of the intestine with which it is connected, taken out of the chick a few days after incubation; *a* is the yolk-bag very much reduced in size, and of an irregular form; *b* the piece of intestine to which the yolk-bag is attached; *c* the ductus vitello intestinalis imperfectly seen, as it is partly covered by the blood-vessels of the yolk-bag; *d* the branch of the mesenteric vein, which furnishes, in the early periods of incubation, the veins of the vascular area; *e* the branch of the mesenteric artery, which goes to the yolk-bag. It divides, passes on each side of the intestine, and unites again before it ramifies upon the yolk-bag.

Fig. 14. shews the chick after the yolk-bag had been taken into the belly; *a* the umbilical opening surrounding the aperture, which is closed, in the present instance, by the contraction of this muscle; *b* some lacerated vessels, and a portion of the chorion hanging from the umbilical aperture; *c* the belly of the chick distended in consequence of the admission of the yolk-bag.

Fig. 15. is a plan of the relative position and magnitude of the contents of the egg about the ninth day of incubation. The view is procured by first boiling the entire egg, and afterwards making an equal section; *a* the edge of the shell; *b* the cavity left between the two layers of the membrane that lines the shell to contain air. This cavity is

considerable at the present period; *c* the chick in its amnios; *d* the yolk; *e* the cut edge of the yolk-bag; *f* the white which has descended to the small end of the egg and diminished; *g* the chalazæ, much nearer each other than they were before incubation.

Fig. 16. exhibits a view of the contents of the egg, with the chorion cut open and turned down off the other parts; *a* the chick seen obscurely, as it is in some measure covered by the membrane that includes the yolk-bag and intestines, besides being surrounded by the amnios, the fluid of which, at the present period is greenish; *bb* the amnios seen at each end of the chick; *c* indicates the yolk-bag, which is divided into three lobes; one of them is seen to lie upon the side of the chick; the blood-vessels of the yolk appear small, and are indistinctly seen; *d* some folds of the membrane which envelops the yolk-bag, intestines, and a part of the chick; *e* the white contained in its proper membrane, and very much reduced in size; *f* the chorion turned down, and therefore the surface that is seen is the internal; *g, g, g*, reflections of fine membrane which attach the chorion to the other membranes; *h, h*, the two trunks of the umbilical arteries, which each divide into two branches, and are distributed to the chorion.

Fig. 17. is intended to explain the formation of that membrane which includes the yolk-bag and the intestines of the chick, and for this purpose the chorion is entirely removed; *a* is the chick contained in the amnios; *b* indicates the membrane of the yolk-bag and intestines; it is seen to cover a certain extent of the amnios and chick; it descends posteriorly to be connected to the septum, between the yolk-bag and the white: anteriorly it is laid open, in order to turn out the yolk-bag, which was before contained in this membrane. Within the chink made by the incision are to be seen the intestines of the chick perfectly uncovered and designated by *c*. The yolk-bag hangs by the ductus vitello intestinalis and its blood-vessels, and is marked by the letter *d*.

Fig. 18. shews an egg with the great end fractured previous to the exclusion of the chick: some more pieces of the shell are removed in order to bring into view the membranes that are lacerated by the bill of the chick; *a* is that portion of the membrane under the shell which forms the air-cell, and in which there is a small aperture. The chorion and amnios are torn to a greater extent to permit the bill of the chick to appear on the outside of the shell; *b* the bill of the chick: beside it are seen some points of feathers projecting out of the opening made in the outer membrane.

Fig. 19. is a portion of the small intestine taken from the adult bird, on which the appendix is placed, that we have described as the remnant of the ductus vitello intestinalis; *a* the intestine; *b* the appendix or cæcum; *c* is a little knot which was, during fetal life, the yolk-bag.

In some of the preceding figures, the form of the chick is represented at different ages, which the reader will understand without the letters of reference.

Of the Uses of the different Parts of the Egg during Incubation, and after the Exclusion of the Chick.—Although there can be no doubt that the chick derives its nutriment from the humours of the egg, the mode in which this is effected is involved in considerable obscurity. Anatomists have entertained very different opinions upon the subject. Some have supposed that both in mammiferous animals and birds, the fœtus is nourished by swallowing or absorbing the liquor amnii.

Hæster, in his *Compendium of Anatomy*, states, that after the contents of the uterus of the cow were frozen, he found

a piece

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a piece of ice of the thickness of a finger extended from the congealed amnios into the mouth of the fœtus, and down the œsophagus as far as the stomach.

There have been sometimes seen also in the stomach of the *fatal calf* the same kind of fatty concretions, that usually exist in the amnios of this animal. The hairs of the *calf* have been discovered in the meconium. New-born infants have been observed to vomit a fluid resembling the liquor amnii.

It has been remarked by Harvey, Haller, and several other writers upon incubation, that the foetal chick frequently opens and shuts its mouth while inclosed in the amnios, as if it were performing the act of swallowing.

The preceding facts leave no doubt that the water of the amnios passes into the stomach of the fœtus, but by no means proves that it contributes to the nourishment of the young animal, but rather the contrary, as if it were either digested in the stomach, or consumed by absorption, it could not be found towards the end of gestation, or after-birth, in the quantity reported.

Those who give credit to the nutrition of the fœtus by the liquor amnii, cite some remarkable cases in which the umbilical cord is said to have been destroyed before birth, or in which the infant has been born with the cicatrix at the umbilicus perfectly formed. See *Observ. rarior cent post pars 1. obs. 32.*—*Journal des savaus, année 1673, p. 69.* *Observat. communic. par Chatton.*—*F. Hoffmann & Triller Dissert. de pinguid e succo nutr. superfl. p. 10.* and *Rommel Ephemer. nat. cur. dic. 2 à 7, obs. 209.*

It should be remarked, that of these observations, some are related in a manner which makes their accuracy very doubtful; and others, even if correctly stated, do not prove the point they are proposed to establish. Thus the infant with the cicatrized navel was not seen by Chatton until five months after birth; and in some of the cases where the cord was said to be injured or putrid while the child was alive, it does not appear that the circulation had been destroyed.

We should not have noticed the doctrine of the nutrition of the fœtus from the liquor amnii, as it is generally discredited, had it not been advanced with some limitation by Lobstein in a modern publication. This author does not pretend that the fœtus swallows the liquor amnii, he allows that the young animal exists and increases in growth, before the digestive organs or even the mouth are formed. He is also aware, that there have been monsters produced in whom the head was wanting. He therefore supposes, that the fluid of the amnios is taken into the body of the fœtus by the absorbents of the skin, which opinion he grounds upon the following circumstances: Many of the cold-blooded animals, he says, have no placenta, but in every species the fœtus floats in a clear liquor, analogous to that of the amnios. This fluid, he remarks, diminishes in proportion to the growth of the fœtus; it likewise remains uncorrupted during foetal life, which fact, he thinks, can only be explained by its passing successively into the body of the young animal. (*Lobstein sur la Nutrition du Fœtus, § 88.*) Our reply to this reasoning would be, that the liquor amnii is not a nutritive fluid perhaps in any instance; that when first perceived, it is in a very small quantity; it is, in the higher classes of animals, contained in a membrane which is continuous with the skin of the fœtus, and which membrane further derives its blood-vessels from the fœtus. It is, therefore, a secretion of the young animal. During several days of incubation it increases as the chick grows, and in the latter periods does not perhaps actually diminish in quantity, but ceases to increase in proportion to the developement of the chick; for

which reason it appears less than it did when the chick was small. The quantity of the liquor amnii at any given time, even admitting that it is not secreted by the fœtus, would be quite insufficient for the formation of the latter. The principal part of this fluid also is lost when the membrane that contains it is ruptured, previous to the liberation of the young animal from the uterus or the egg. We should, on all these grounds, deny that the liquor amnii is destined to sustain the fœtus in any circumstances.

In all oviparous animals, there is no necessity for supposing the liquor amnii to be a nutritive fluid, as there are other humours provided for the purpose of nourishing the fœtus. The sources of nutriment, during foetal life, are particularly evident in the ovum of birds.

In the history of incubation it will be found, that the albumen begins to diminish as soon as the fœtus becomes apparent, that it continues to decrease regularly as the chick grows, and that this fluid is entirely consumed at the end of incubation: there is, therefore, no doubt that the white of the egg is the substance from which the chick is formed. It has been supposed by some writers, that the yolk also contributes to the support of the chick while in the egg. This opinion rests chiefly upon the circumstance of the yolk becoming larger and more fluid after the white begins to diminish, which has been attributed to the albumen passing into it, that the two fluids might be mixed together, and afterwards converted into the substance of the chick. Maitre Jan, Leveille, and others believed, that the white is absorbed by the chalazæ, and thus conveyed into the yolk-bag, and Leveille has even pretended to demonstrate the tubular structure of one of the chalazæ. We have already stated, that by the strictest examination we could not perceive the structure described by Leveille; we are therefore led to conclude, that the fluidity of the yolk, during incubation, is occasioned by the organization of that humour undergoing a change from the application of heat. We have found also the yolk become fluid when eggs were fat upon, which had not been fecundated by the cock, and in which the white was not sensibly diminished. The weight of the yolk at the end of incubation, almost proves that it is not concerned in the nourishment of the chick, until after the animal is excluded from the egg.

We confess, however, that we are unable to form a decided opinion with respect to the manner in which the albumen is carried into the body of the chick. Throughout incubation the white tends to the lower and small end of the egg; the chick is placed at the upper and great end. There is, therefore, no direct communication between the chick and the albumen. The blood-vessels of the egg have apparently no immediate connection with the white, until its proper membrane is formed, at which time this humour is already much reduced, and even then there are only a few wandering vessels spread over its membrane. These facts afford reason for the supposition that the white passes into the yolk-bag, through the chalazæ; but, on the other hand, it is scarcely credible that the white, after being mixed with the yolk, should alone be absorbed during incubation, and the latter fluid left undiminished.

The chalazæ, whether they perform the office of absorbents or not, act as ligaments to the yolk-bag, and have the effect of keeping, throughout incubation, that surface of the bag uppermost on which the chick is situated, in order that it may receive heat from the hen. See *Egg*.

The use of the vesicula umbilicalis is a subject on which no satisfactory theory has been yet made out.

The older anatomists supposed this part to be a reservoir of urine, and gave it the name of *allantois*. Lobstein considers

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ders the fluid of the vesicula and the allantois as the nutriment of the fetus during the first periods of its existence. Soemmerring and Blumenbach suppose that the vesicula umbilicalis is intended for the nourishment of the fetus in the human subject. Although it does not appear that this use of the vesicula or allantois has been in any degree proved, the arguments employed are conclusive against it being a reservoir for urine, and particularly so with respect to birds and the human subject.

The vesicula umbilicalis attains a considerable size, and is filled with its proper fluid before the kidneys exist; and although the membrane continues to increase, the quantity of the fluid it contains by no means keeps pace with the growth of the kidneys. We cannot admit the reasoning of Haller, who concludes that the existence of fluid in the allantois is a proof that the kidneys secrete urine before they are visible. It has not yet been ascertained that the fluid contained in the allantois is urine even in quadrupeds, where this bag communicates so plainly with the bladder. Lobstein found, after the allantois had acquired a very considerable bulk, that the kidneys were small and pale, and resembled organs which had not yet been called into action. The bladder also was contracted. He very judiciously remarks, that if the allantois were distended to the size that it is known to possess in the early periods of gestation and incubation by the secretion of the kidneys, it would become before birth a most prodigious sac. It is extremely improbable that the secretion of urine should diminish or be suspended after the kidneys were perfectly formed, by which supposition alone the smaller relative size of the allantois in the latter periods of foetal life could be explained.

We may further observe, that there is no reservoir provided for any of the other secretions of the fetus, and that even the gall-bag is not remarkably distended, although it evidently contains bile some time before birth, and notwithstanding the liver is the largest gland in the body.

In describing the progress of incubation, we have mentioned, that the vesicula umbilicalis of birds contributes to the formation of the membrane called the chorion; that its fluid disappears, leaving behind it some layers of a soft calcareous substance, resembling the excrement of birds, or rather the solid parts of the urine of those animals. This excrementitious matter has been considered a proof of the vesicula being the receptacle of the urine, but it should be observed that the same sort of substance is found after the consumption of all the fluids of the egg.

The functions of the vesicula umbilicalis in birds, if there be any peculiar to it, are lost in those of the chorion.

By recurring to the history of incubation, it will be found that the external membrane of the yolk-bag, on which the vascular area is spread, and the chorion, receive a vastly larger quantity of blood than circulates at any one moment in the body of the chick. The chorion is not originally a vascular membrane; its vessels arise with the vesicula umbilicalis, by which they are conducted from the body of the fetus. The vascularity of the chorion in some degree succeeds that of the vascular area; it appertains chiefly to the arterial system, whilst that of the area is almost entirely produced by veins.

The use most commonly ascribed to these two great systems of extraneous vessels, is the oxydation of the blood of the fetus, for which purpose it is also believed that the air is admitted into the great end of the egg. We have, however, been led to entertain a different opinion of the offices of the vascular area, chorion, and air-cell, in consequence of some experiments we have made, which we shall lay before the reader.

Experiment 1.—Two eggs of a hen were opened at the great end by destroying the shell and outer layer of the membrane composing the air-cell. The blood-vessels were seen through the membrane of a deep purple colour. Being exposed to the atmospheric air, they became, in a few minutes, a vivid scarlet. The same eggs were then placed in a jar filled with fixed air, and their blood very soon re-assumed its original purple colour; and upon the eggs being again brought into the common air, the scarlet colour of the blood was speedily revived. One of these eggs had its blood rendered venous and the other arterial, in the manner above-mentioned. Both were then placed in a vessel of water, in which they remained all night, and on the next morning each continued to preserve its proper colour.

Ex. 2.—We took an egg which had been fat upon 18 days, and having removed a square portion of the shell and membrane forming the air-cell, about a quarter of an inch in size, it was placed in a jar of carbonic acid gas, over a bath of quicksilver, which was kept throughout the experiment, as nearly as possible, at the temperature of 104° Fahrenheit. The motions of the chick cause an egg to roll upon a smooth surface, but in this instance no motion was perceived. After the egg had remained an hour in the fixed air it was taken out, and the aperture of the shell was carefully closed with paper and glue, and two hours elapsed before the egg began to roll upon the surface of the mercury. Upon this occasion, therefore, the chick appeared to have been submitted three hours to the influence of carbonic acid gas without being destroyed.

Ex. 3.—An egg, at the 18th day of incubation, was deprived of the greatest part of the shell, and of the membrane that lines the shell, so that the vessels of the chorion were fully exposed. The membrane of the chorion was moistened to increase the effect. The egg was suffered to remain for 25 minutes in the fixed air, during which time the chick shewed no motion; but upon being removed into atmospheric air it struggled as usual.

Ex. 4.—The air contained in the cells, during the latter stages of incubation, was collected from a number of eggs, and subjected to experiment in a graduated glass tube. It afforded, as nearly as may be, the same products that are obtained from atmospheric air, after it has been spoiled by respiration; from which it would appear, that it was the presence of undiluted fixed air in the 2d and 3d experiments that caused the motions of the chick to cease, and not the absence of oxygen gas.

Ex. 5.—Being aware of the fatal effects upon the chick, which have been reported to follow covering the shell of the egg, so as to stop the further admission of air into it, we varnished the surface of several eggs at different periods of incubation. The result of this experiment was nearly the same in every instance. The chick always died; not, however, immediately, but in two, three, or four days, and apparently not in consequence of being unsupplied with fresh air, but from being unprovided with any kind of air to occupy the space caused by the expenditure of the fluid contents of the egg in the formation of the chick: for, in these cases, we found the yolk more or less disorganized, the membranes sometimes ruptured; and the fetus always malformed or imperfectly developed. If the death of the chick had been occasioned by the deprivation of oxygen, it would have been immediate, and unattended with any change in the structure of the fetus.

The gradual admission of air into the eggs of birds takes place as a matter of necessity, because the shell, being hard and unyielding, cannot accommodate its form to the bulk of its contents in proportion as they diminish; for the parts originally

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nally contained in the egg occupy a much larger space, as already mentioned, than when the chick is fully formed.

The preceding experiments prove that the air does not pass into the egg for the purpose of effecting any change in the blood of the foetal chick, similar to the process of respiration, as has been generally supposed. It is true, nevertheless, that when the blood is first exposed to the air contained in the great end of the egg, it becomes oxydated by it; and hence, during the first days of incubation, all the blood-vessels of the vascular area are observed to be of an arterial colour: but as there are no means of expelling the air as it becomes spoiled, and as the supply of pure air afterwards is too small in quantity to produce any effect upon the blood, all the vessels are of the purple or venous colour in the latter periods of incubation. This appearance of the blood has been observed to exist by many writers upon incubation, and coincides with the experiments we have related above.

It may be asked, what end is answered by the distribution of so much blood to the membranes of the egg, if it be not for its exposure to oxygen gas? This is a question which, perhaps, cannot be solved by direct experiments.

We conceive, however, that it is necessary, during foetal life, to have a greater quantity of blood formed than is employed in the organs of the young animal. The functions of the blood-vessels of the foetus are almost confined to the creation of its body; but in the adult animal the principal part of the mass of blood is consumed in furnishing the various secretions. The vascular membranes of the ovum may be considered as performing the office of the various secretory organs, the actions of which are dormant, at least during the early periods of foetal life. By this means also the organs of the body are accustomed to the preparation and presence of a quantity of blood which is wanted immediately after the young animal leaves the uterus or the egg: indeed, without such a provision, it would seem to be impossible for the foetus to assume, in a moment, the functions of an independent state of existence.

Further, the extraneous circulation on the membranes appears to be the means by which the nutritive fluids of the egg are converted into blood. This is almost demonstrated in the vascular area, in which the red blood appears before its vessels have any visible connection with the body of the chick.

The *membrane* containing the vascular area, therefore, we deem the organ of nutriment and assimilation. It corresponds to the different viscera which convert the food into blood in the full-grown or perfect animal. The *chorion* of birds supplies the place of the viscera, which return the particles of the adult body to the common stock of nature. We could draw many arguments in support of this theory from the anatomy of the lower classes of animals, and from the structure of the vascular system in particular animals of a higher rank; but it does not seem consistent, with the nature of the present article, to enter into an extensive physiological discussion.

If it be admitted that the blood of the foetus does not receive that effect from the air which gives the arterial character, it becomes desirable to ascertain the power of the foetus for generating animal heat. With this view we have instituted the following experiments.

Ex. 1.—An egg, on which the hen had sat 17 days, was placed upon a bath of mercury heated to 104° of Fahrenheit, and kept at that temperature for several hours. The heat of the room was 75°. The upper surface of the membranes, when the shell was broken to admit the thermometer, raised the instrument to 92°. The interior of the egg was 95°, and

on the instrument being thrust down so as to touch that part of the shell in contact with the mercury, it did not rise higher than 100°. From this experiment, the standard heat of the chick appeared to be about 95°.

Ex. 2.—An egg, at the same period of incubation as the last, had the shell entirely removed, and was placed upon a mercurial bath at the heat of 83°, the air of the apartment being 75°. The centre of the egg preserved the instrument at 88°, and when pushed down upon the membranes next the mercury, it did not fall below 85°.

Ex. 3.—A chick, about 18 days old, was removed from the egg and its membranes, and exposed for some time upon the surface of a bath of quicksilver at the temperature of 79°, and becoming gradually cooler as the heat of the surrounding air was 75°. The thermometer was introduced into the thorax of the chick, and stood at 80° for a short time, even after the chick had died.

The heat of the different parts of the incubated egg cannot be expected to correspond with each other as long as external heat or cold is applied to one surface only, but the three last-mentioned experiments, notwithstanding, appear to us conclusive, with respect to the foetal chick possessing an independent temperature, and being capable of resisting, to a certain extent, both foreign heat and cold.

It is proper to observe, that we have made some experiments with respect to the oxydation of the blood, and the animal heat of the foetus in mammalia, which entirely correspond in their results with those above related; and, therefore, fortify our opinion with regard to the absence of any process analogous to respiration during foetal existence, and likewise prove that the young animal has an independent temperature.

We have already mentioned that the yolk loses very little, if any, of its original weight during incubation; but that after the chick is excluded from the shell it is speedily consumed. This humour, therefore, is obviously designed for a provisional nutriment to sustain the chick until it is able to procure a sufficient quantity of its natural food. This disposition of the yolk is particularly necessary to those birds that live in a wild state, but is useful to all.

Anatomists are divided with respect to the manner in which the yolk is conveyed into the system of the chick. Some assert that it passes into the alimentary canal, through the ductus vitello intestinalis, where it is digested previous to its being absorbed by the lacteals. Others deny that it is to be found in the stomach or intestines, and believe that it is absorbed immediately from the yolk-bag. We are disposed to adopt the latter opinion, both from never having been able to discover any yolk in the intestinal canal, and from a number of reasons, which indirectly go to disprove the passage of the yolk through the ductus vitello intestinalis.

In the first place, there does not seem to be any power by which the yolk can be transmitted into the intestine. The yolk-bag itself has no muscular coat, and the mere pressure of the parietes of the abdomen of the chick, even if sufficiently strong, would be exerted as much upon the intestines as the yolk-bag, and might therefore as readily urge the contents of the former into the latter, as the yolk into the gut; for the ductus vitello intestinalis does not penetrate the coats of the intestine obliquely, so as to produce the effect of a valve; but has merely a slight contraction at the orifice, which must operate equally on both sides.

There would appear to be no necessity for the yolk to pass into the alimentary canal, or to be subjected to any process of digestion or assimilation previous to its entering the

the system of the chick. It is already a vital fluid, which is proved by Mr. Hunter's experiments upon the temperature of eggs. (See EGG.) If the humours of the egg did not possess vital properties, they would very soon become putrid from the heat of incubation.

When we contemplate the structure of the yolk-bag, it must be perceived to be not only continuous with the intestinal canal, but to resemble the latter in organization, except that the muscular coat is wanting. The external membrane of the bag differs in no respect from the peritoneal coat of the intestines; and the internal membrane is so analogous to the villous coat, that we cannot hesitate to allow them the same functions. No advantage, therefore, would be gained by the passage of the yolk into the intestine.

The absorption of this humour, by the valvular or internal membrane of the yolk-bag, seems proved by the organization of the yolk undergoing a change upon the surface which is in contact with the membrane, while the central part is unaltered. The circumstance also, of a concrete substance, resembling the residue of the albumen, being left in the yolk-bag after the nutritious parts of the yolk are consumed, affords a strong evidence that the latter are removed by a process of absorption; for if the yolk passed through the ductus vitello intestinalis, it would disappear without distinction of parts.

The authors who believe that the yolk is carried into the system without a previous preparation in the alimentary canal, attribute the office of absorption to the red veins. In proof of this opinion Blumenbach and others state that they have detected upon some occasions a yellow fluid in the veins of the bag, which they have supposed to be the yolk in its passage. Notwithstanding this appearance, which we have sometimes also seen, it appears to us most probable that the yolk is absorbed by the same system of vessels which take up the chyle from the small intestines. The yolk-bag and intestinal canal, as already mentioned, are continuous parts, and similarly organized. The yolk-bag is, in fact, a process of the intestines, and should be considered as a portion of the body of the chick. It is supplied by the same blood-vessels as the intestines; why should we therefore deny it the lacteal vessels?

Another argument against the absorbing function of the veins of the yolk-bag may be deduced from the size of these vessels at different periods. During the early part of incubation they are large and numerous; but after the yolk-bag passes into the abdomen of the chick, where their absorbing function chiefly, if not entirely, exists, if it does at all, they become smaller and fewer than the arteries. The vessels of the yolk-bag, when they constitute the vascular area, are the organs of sanguification for the chick. After incubation they appear to become the nutritious vessels of the bag itself.

It may seem not easy to assign a use for the ductus vitello intestinalis, unless we grant it to be for transmitting the substance of the yolk into the alimentary canal. If, however, this should not be the case, still a communication would probably exist between the yolk-bag and the intestine; for it is without example, we believe, for the continuity to be interrupted by two adjoining cavities that have a similar organization. The ductus vitello intestinalis we think, therefore, would exist as a matter of course, independently of any offices it might perform. We have described the purposes this part serves in the full grown bird; it is not, therefore, without its uses.

VOL. XIX.

For the history of foetal life in oviparous animals in general, see OVUM.

INCUBUS, in *Medicine*, from the Latin *incubare*, to lie or sit upon, the same with the English *night-mare*, signifies a state of imperfect sleep, accompanied with an oppression of the breathing, and frightful dreams.

By the Greeks this affection was designated by a name of similar import, *ἐπιπληξίς*, *epiphaltes*, from the verb *ἐφαλλομαι*, *I leap upon*; and it has received various other appellations expressive of the sense of weight and oppression of the chest, the laborious respiration, &c. as well as indicative of the hypotheses by which its occurrence was explained. Thus it has been called *ἐπιπληξίς*, *epiplexia nocturna*, *asthma nocturnum*, &c.; and by Pliny, *ludibria fauni*, from the same notion which dictated the more modern appellations of *bag-riding*, *wizard-pressing*, *mare-riding*; *dier mahr*, or *das reiten der mahr*, of the Germans; *cocbemar* of the French; *night-mare*, &c.

This disorder seizes persons, while sleeping, who imagine that they feel an extraordinary compression or weight about the breast and stomach, which they cannot by any effort shake off. In this agony they sigh, groan, and utter indistinct sounds; sometimes they cry out, but more frequently they attempt to speak, or to move in vain. These feelings give rise to various frightful suggestions of the imagination: the patient fancies himself to be struggling with strong men or devils, or to be in a house on fire, or in danger of being drowned in the sea or some river; and in attempting to run away from danger, or climb up a hill, he fancies he falls back as much after every step as he had advanced before. At length the sensations of oppression become intolerable, and the patient awakes; but the terror excited by the frightful ideas attending the night-mare, leaves often a palpitation of the heart, with great anxiety and languor, and sometimes a tingling of the ears, and a tremor over the whole body.

It is altogether unnecessary to attempt an enumeration of the numerous hypothetical explanations which have been attempted to be given of the phenomenon of *incubus*, and which have been detailed by Awen, Bond, and other writers. (See Awen, *Posit. inaugur. de Incubo*. Argentorat. 1676. Bond, *Essay on the Incubus or Night-mare*, 1753.) The disorder has commonly been supposed to proceed from a stagnation of the blood in the sinuses of the brain, or in the vessels of the lungs, or from too great a quantity of blood being sent to the head. The horizontal posture, in time of sleep, and the pressure of the stomach upon the *aorta*, in a supine situation, have been thought sufficient to occasion a more than usual distention of the *sinuses* and other vessels of the brain; and the weight of the heart, pressing on the left auricle and large trunks of the pulmonary veins, may, it is supposed, prevent the easy return of the blood from the lungs, and thus produce an oppression and sense of weight and suffocation in the breast. (See Bond, chap. ii.) But without entering into a particular examination of these opinions, which are far from being satisfactory, we may observe, with Dr. Whytt, that, if they were true, some degree of the night-mare ought to happen to every body that lies upon his back, especially after eating a full meal. Further, if a horizontal situation could overcharge the brain with blood, so as to occasion the *incubus*, how comes it that people, who remain for some time in an inverted posture, do not feel this disease beginning to attack them? And why does a slighter degree of the night-mare sometimes seize people who sleep in an erect situation in a chair? a circumstance which sometimes occurs, not only after eating, but when the stomach is out of

. F order,

order, and troubled with wind. As the weight of the stomach, even when filled with food, can have scarcely any effect upon the motion of the blood in the *aorta*, so the pressure of the heart is by much too small to be able sensibly to retard the motion of that fluid in the pulmonary veins, otherwise, people exhausted by tedious diseases, who generally lie on their back, would be constantly affected with the *incubus*.

We know that certain medicines or poisons, worms, and even corrupted bile, or other humours, by disagreeably affecting the nerves of the stomach, produce an oppression about the breast, wild imaginations, frightful dreams, raving, and insensibility; and there is no doubt that low spirits, melancholy, and disturbed sleep, often proceed from a disordered state of the stomach. It seems, therefore, more probable that the seat of the night-mare is principally in that organ. It is well ascertained that some forms of epilepsy, and of hysterical fits, originate from disorder in that *viscus*; and Galen considered the *incubus* as a nocturnal or slighter epilepsy. People troubled with nervous and hypochondriac affections, and who have delicate or flatulent stomachs, are more peculiarly subject to this disorder; and it is observed, that a heavy or flatulent supper greatly aggravates the night-mare, in those who are predisposed to it. The sympathy of the stomach with the head, heart, lungs, and diaphragm, is so remarkable, that there can be no difficulty in referring the several symptoms of the *incubus* to a disagreeable irritation of the nerves of the stomach.

The *incubus* is most apt to seize persons when lying on their back, because, in this position, on account of the stomach and other abdominal viscera pressing more upon the diaphragm, we cannot inspire with the same ease as when we sit up or lie on one side. Further, in that situation of the body the food seems to lie heavier on the stomach, and wind in it does not separate so readily by the *æsophagus* and *pylorus*, as in an erect posture, when these orifices are higher than the other parts of the stomach. The night-mare only occurs in the time of sleep, because the strange ideas excited in the mind, in consequence of the disordered feelings of the stomach, are not then corrected by the external senses as they are when we are awake; nor do we, by an increased respiration or other motions of the body, endeavour to shake off any beginning uneasy sensation about the stomach or breast. The *incubus* generally occurs in the first sleep, and seldom towards morning, because at the earlier period the stomach is more loaded with food, and that in a more crude and indigested state than in the morning. A lesser degree, amounting only to frightful dreams, is almost a constant concomitant of overloaded stomach in some habits. See DREAM.

In fact, if the night-mare were owing to a stagnation of the blood in the lungs from the weight of the heart, or in the sinuses and other vessels of the brain from the horizontal posture of the body, it would become greater the longer it continued, and would scarcely ever go off spontaneously. But we know that this disease, after affecting people for some time, often gradually ceases, and is succeeded by refreshing sleep: for as soon as the load of meat, or wind, or other cause disagreeably affecting the nerves of the stomach is removed, the oppression and weight on the breast, wild imaginations, frightful dreams, &c. vanish; as all these proceed originally from the disorder of the stomach. It may be remarked, however, that, as neither flatulency, phlegm, nor crudities in the stomach, ever produce the symptoms of *hypochondriasis*, unless the nerves of that organ be indisposed; so neither a horizontal posture, sleep, nor heavy suppers, ever

produce the night-mare, at least in any considerable degree, unless the person be already predisposed to the complaint, from the particular condition of the nerves of the stomach.

But although the stomach is the part commonly affected primarily in the case of *incubus*; yet symptoms like those of the night-mare may sometimes arise without any fault of the stomach, when the lungs, or even the brain, are affected. Thus Dr. Whytt observes, that asthmatic patients, whose lungs are much obstructed, are sometimes disturbed, in time of sleep, with distressing dreams, and oppressed with a sense of suffocation. Startings and oppressions about the præcordia, with painful dreams, are indeed common occurrences from *hydrothorax*, chronic coughs, and other pulmonary obstructions; but they are not strictly analogous to the common night-mare. Dr. Lower mentions a patient, who, though he could sleep pretty easily with his head inclined forward; yet, in the opposite situation, he was always soon awaked with horrid dreams and tremors; the cause of which appeared, after his death, to have been a great quantity of water in the ventricles of the brain. At all events, a plethoric state of habit, by rendering the circulation through the lungs less free, may help to produce, or at least increase, the oppression of the breast in the night-mare.

The Cure.—As *incubus*, then, is only a symptom of disordered or loaded stomach, and arises out of the irritation and morbid feelings which are thus produced during sleep, the relief of the disease, generally speaking, lies within a narrow compass. *Temperance* in eating and drinking, especially at late hours; taking, in fact, either extremely light suppers or none at all; and when the dinner is so late as to be only a supper with another name, being cautious that that also should be moderate in quantity, and easily digestible and unstimulating in its nature; drinking thin, sub-acid liquors, where these are agreeable to the constitution,—these are the principal remedies required. Brisk active exercise, by which the digestive powers may be aided and the stomach strengthened, is also advisable. It were useful, too, to sleep with high pillows, and to lie on the side as much as possible, in preference to the back. If the functions of the stomach are much disordered with flatulency, heart-burn, acidity, or oppression, with pain, or nausea, after taking food, the remedies recommended for *indigestion* (which see) must be resorted to. The bowels should be kept open. See Whytt on Nervous Disorders. chap. vi. § 18.

INCUMBENT, in *Law*, a clerk resident on his benefice, with cure.

He is called incumbent of such church, because he ought to bend his whole study to discharge his cure. See RECTOR and VICAR.

INCUMBRAVIT. See QUARE *incumbravit*.

INCURABILI, the name of one of the celebrated conservatorios or music-schools at Venice, where orphan girls, or girls of worthy parents in indigence, used to be well educated and regularly bred to music as a profession. Gallippi was master of this conservatorio in 1770, when the composition and performance were exquisite.

INCURVATION, the act of bending a bone, or other body, from its natural shape.

INCURVATION of the Rays of Light. See LIGHT, and REFRACTION.

INCUS, in *Anatomy*, one of the small bones contained in the cavity of the tympanum. See EAR.

INCUSSU, in *Geography*, a town of Africa, in the kingdom of Congo; 80 miles S. of St. Salvador.

INDAL, a town of Sweden, in the province of Medelpad,

pad, on a river of the same name. N. lat. $62^{\circ} 34'$. E. long. $16^{\circ} 23'$.

INDEA, a town of Africa, in the kingdom of Yemina, on a river of the same name.

INDEBITATUS ASSUMPSIT, in *Law*. See **ASSUMPSIT**.

INDECIMABLE, **INDECIMABILIS**, is applied to things not tithable, or which by law ought not to pay tithes.

INDEFEASIBLE, or **INDEFEAZABLE**, signifies what cannot be defeated, or made void. As, a good and indefeasible estate. No one, who considers our laws, constitution, and history, without prejudice, and with any degree of attention, will assert, that the doctrine of hereditary right implies an indefeasible right to the English throne. See *Right of Crown*.

INDEFINITE, **INDETERMINATE**, that which has no certain bounds, or to which the human mind cannot affix any. Des Cartes uses the word, in his philosophy, instead of infinite, both in numbers and quantities, to signify an inconceivable number, or number so great, that an unit cannot be added to it; and a quantity so great, as not to be capable of any addition.

Thus, he says, the stars, visible and invisible, are in number indefinite; and not, as the ancients held, infinite; and that quantity may be divided into an indefinite number of parts, not an infinite number.

INDEFINITE is also used, in the *Schools*, to signify a thing that has but one extreme: for instance, a line drawn from any point, and extended infinitely.

Thus, what they call *eternity a parte ante*, or *eternity a parte post*, are indefinite durations.

INDEFINITE, in *Grammar*, is understood of nouns, pronouns, verbs, participles, articles, &c. which are left in an uncertain indeterminate sense, and not fixed to any particular time, thing, or other circumstance.

INDEFINITE Proposition, in *Logic*. See **PROPOSITION**.

INDELAVOY, **ENDELAVOY**, or *Indelvai*, in *Geography*, a town of Hindoostan, in Golconda, lying in the route between the Godavery and Hydrabad; 75 miles N. of Hydrabad. N. lat. $18^{\circ} 26'$. E. long. $78^{\circ} 40'$.

INDELIBLE, formed from *delere*, to blot, with the preposition *in*, taken negatively, that which cannot be blotted out, or effaced.

Thus baptism, and the order of the priesthood, are said to convey indelible characters.

INDEMNITY, formed from the negative *in*, and *damnum*, loss, in *Law*, an act by which one promises to guarantee, or save harmless some other person from any loss or damage that might accrue to him on any particular account.

When a church is appropriated to an abbey, or college, the archdeacon loseth his induction money for ever; in recompence whereof he shall have yearly, out of the church so appropriate, one or two shillings, more or less, for a pension, as was agreed at the time of the impropriation; and this pension is called an indemnity.

INDEMNITY, with regard to estates. See **WARRANTY**.

INDEMNITY. See *Act of GRACE*.

INDEN, in *Geography*, a town of Switzerland, in the Valais; 18 miles E. of Sion.

INDEN-HOTUN, a town of Chinese Tartary, the capital of the Mantchew Tartars, where they began to establish their empire over China. N. lat. $41^{\circ} 45'$. E. long. $124^{\circ} 36'$.

INDENTATIONS of the Coast of the Ocean, in *Geology*, or the peninsulas, headlands, points, bays, gulfs, estuaries,

&c. which occur on the shores of most islands and continents, are phenomena worthy the attentive consideration of geological observers. M. de Luc, in his *Geological Travels*, vol. i. p. 333 and 336, has considered many of the circumstances attending the headlands and gulfs of the northern coast of Europe, and very properly represents, that they arise from the system of vallies and hills, which are seen inland, continuing down much below the present level of sea, even to the greatest fathomable depths in some instances: and Mr. Farey, who has remarked on this part of M. de Luc's work in the *Philosophical Magazine* (vol. xxxvi. p. 7.), observes, that the hills all evidently ran out in headlands into the sea, just as they would into a sea at a level considerably above the present, of which a perfect idea may be obtained by tracing an extended level line in any country; and that the operations of the tides and waves have a powerful tendency, in most instances, to lessen the indentations of the coasts, by washing away the projecting points of hills, and throwing up the alluvial matters therefrom in the intervening gulfs, where marshes are accumulated; and that the coasts, where cliffs or precipices occur at the headlands only, have not originated, in most instances, from faults or depressions of the strata under the sea beach, but are occasioned by the falling and washing away of the points of the hills. It is evident, that where rocky cliffs fringe the borders of the gulfs, as well as the headlands of a district, such cliffs have a different origin from those which are confined to the headlands. See *ENCROACHMENT of the Sea*.

INDENTED, **INDENTEE**, in *Heraldry*, is when the outline of a bordure, ordinary, &c. is notched, in form of the teeth of a saw.

INDENTED Leaf. See **Serrated LEAF**.

INDENTED Line, in *Fortification*. See **REDENS**.

INDENTED Medals and Wheel. See **MEDALS and WHEEL**.

INDENTURE, in *Law*, a writing which comprises some contract between two, at least; being indented at top answerable to another part, which has the same contents. See **DEED**.

INDEPENDENT Company and Troop. See **COMPANY and TROOP**.

INDEPENDENTS, in *Ecclesiastical History*, a sect of Protestants in England and Holland: so called, as denying not only any subordination among their clergy, but also all dependency on any other assembly.

They maintain, that every separate church, or particular congregation, has in itself radically and essentially every thing necessary for its own government; that it has all ecclesiastical power and jurisdiction; and is not at all subject to other churches, or their deputies, nor to their assemblies, or synods.

Robinson, the founder of the sect, makes express use of this term in explaining his doctrine relating to ecclesiastical government: "Cætum quemlibet particularem," (says he, in his *Apologia*, cap. 5. p. 22) "esse totam, integram et perfectam ecclesiam ex suis partibus constantem, immediate et independentem (quoad alias ecclesias) sub ipso Christo." It may probably have been from this very passage that the title of independents was originally derived. The disciples of Robinson, originally called *Brownists* (which see), because John Robinson, the founder of this sect, was pastor of a congregation of Brownists that had settled at Leyden, did not reject the appellation of Independents. It was certainly utterly unknown in England before the year 1640: at least it is not once mentioned in the ecclesiastical canons and con-

stitutions that were drawn up during that year, in the synods or visitations held by the archbishops of Canterbury, York, and other prelates, in which canons all the various sects that then subsisted in England are particularly mentioned. See Wilkins's *Concilia Magnæ Britannię et Hibernię*, vol. iv. cap. 5. p. 548.

It is true, that not long after this period, and more particularly from the year 1642, we find this denomination very frequently in the English annals. The English Independents were so far from being displeased with it, that they assumed it publicly in a piece, which they published in their own defence at London, in the year 1644, entitled "Apologetical Narration of the Independents." But in process of time, in order to avoid the odium of sedition and anarchy charged on this sect, the true and genuine Independents renounced this title, and called themselves "Congregational Brethren;" and their religious assemblies "congregational churches." The first independent, or congregational church in England, was set up in the year 1616, by Mr. Jacob, who had adopted the religious sentiments of Robinson. The Independents, though sprung originally from a congregation of Brownists, were much more commendable than the latter, both in the moderation of their sentiments, and the order of their discipline. The Brownists, as we have already mentioned under that article, allowed all ranks and orders of men promiscuously to teach in public, and to perform the other pastoral functions; whereas the Independents had, and still have, a certain number of ministers, for the most part regularly educated, chosen respectively by the congregations where they are fixed; nor is any person among them permitted to speak in public, before he has submitted to a proper examination of his capacity and talents, and been approved of by the congregation to which he ministers. The charge alleged against them by our historian Rapin, (*Hist. of England*, vol. ii. p. 514. fol. ed.) who says, that they could not so much as endure ordinary ministers in the church, &c. is, therefore, evidently false and groundless. He was led into his mistake by confounding the Independents and Brownists. There are other charges, no less unjustifiable, that have been urged against the Independents by this celebrated historian, and others of less note. Rapin says, that, with regard to the state, they abhorred monarchy, and approved only a republican government. This might have been true with regard to several persons among the Independents, in common with those of other sects; but it does not appear from any of their public writings that republican principles formed the distinguishing characteristic of this sect. On the contrary, in a public memorial drawn up by them in 1647, they declare, that "they do not disapprove of any form of civil government, but do freely acknowledge that a kingly government, bounded by just and wholesome laws, is both allowed by God, and also a good accommodation unto men." The Independents, however, have been generally distinguished by the denomination of regicides, under a notion that they were chargeable with the death of Charles I. Whether this fact be admitted or denied, and this is not a place proper for the investigation of it, no conclusion can be fairly drawn from the greater prevalence of republican principles, or from violent proceedings at that period, that can affect the distinguishing tenets and conduct of the Independents in general; and especially of the sect that bears this denomination in our times. It is certain that our Independents are steady friends to a limited monarchy. Rapin is farther mistaken, when he represents the religious principles of the Independents as contrary to those of all the rest of the world. It appears from two

confessions of faith, one composed by Robinson, on behalf of the English Independents in Holland, and published at Leyden in 1619, entitled "*Apologia pro Exulibus Anglis, qui Brownistę vulgo appellantur*," and another drawn up in London in the year 1658, by the principal member of this community in England, entitled "A Declaration of the Faith and Order owned and practised by the Congregational Churches in England, agreed upon and consented unto by their Elders and Messengers, in their Meeting at the Savoy, O. S. 12, 1658;" as well as from other writings of the Independents, that they differed from the rest of the reformed in no single point of any consequence, except that of ecclesiastical government; and their religious doctrines were almost entirely the same with those that are adopted by the church of Geneva. During the administration of Cromwell the Independents acquired very considerable reputation and influence; and he made use of them as a check to the ambition of the Presbyterians, who aimed at a very high degree of ecclesiastical power, and who had succeeded, soon after the elevation of Cromwell, in obtaining a parliamentary establishment of their own church government. But after the restoration of Charles II. their cause declined; and in the year 1691, under the reign of king William, they entered into an association with the Presbyterians residing in and about London, under certain heads of agreement, comprized in nine articles, that tended to the maintenance of their respective institutions. These may be found in the second volume of Whiston's *Memoirs of his Life and Writings*; and the substance of them in Mosheim, *ubi infra*.

At this time the Independents and Presbyterians, called from this association the United Brethren, were agreed with regard to doctrines, being generally Calvinists, and differed only with respect to ecclesiastical discipline. But, at present, though the English Independents and Presbyterians form two distinct parties of Protestant dissenters, they are distinguished by very trifling differences with regard to church government; and the denominations are more arbitrarily used to comprehend those who differ in theological opinions. The Independents are generally more attached to the tenets distinguished by the term orthodoxy or calvinism, than the Presbyterians.

Independentism is peculiar to Great Britain, the United States of America, where it was carried first in 1620, and by successive Puritan emigrants in 1629 and 1633, from England, and the United Provinces. One Morel, in the sixteenth century, endeavoured to introduce it into France; but it was condemned at the synod of Rochel, where Beza presided; and again at the synod of Rochel, in 1644.

On the subject of this article, see Mosheim's *Eccl. Hist.* by Maclean, vol. v. p. 398, &c. 8vo. Neal's *Hist. of the Puritans*, vol. ii. p. 107, &c. vol. iii. p. 547, &c. vol. iv. p. 187, &c. Burnet's *Hist. of his Own Times*, vol. i. p. 46, &c.

INDERGEREE, in *Geography*, a river on the N. E. coast of Sumatra, which runs into the sea. S. lat. $0^{\circ} 33'$. E. long. $103^{\circ} 20'$.

INDERGUR, a town of Hindoostan, in Guzerat; 15 miles E. of Damaun.

INDERMAY POINT, a cape on the N. coast of Java. S. lat. $6^{\circ} 12'$. E. long. $108^{\circ} 18'$.

INDERSKAIA, a town of Russia, on the river Ural; 72 miles N. of Gurev.

INDERSOUL, a town of Hindoostan, in Baglana; 12 miles E. of Bahbelgong.

INDER-TAUPPLITZ, a town of the duchy of Stiria, on the Enns; 14 miles W. of Rottenman.

INDERVA,

INDERVA, a small island in the Persian gulf; 50 leagues W. of Ormus.

INDETERMINATE, in *Geometry*, is understood of a quantity either of time or place, which has no certain or definite bounds. See INDEFINITE.

INDETERMINATE *Analysis*, is a particular branch of algebra, in which there is always proposed a greater number of unknown quantities than there are equations; whence, from what we have seen under the article ALGEBRA, the questions become unlimited; but in this species of equations, the solutions must always be given in integers, or rational fractions; and this condition frequently fixes a limit to the number of answers that an equation admits of, and even sometimes renders the problem impossible; though, in the generality of cases, the number of solutions is indefinite. When, amongst the unknown quantities, there are none that exceed the simple power, the equation is said to be of the *first degree*: when the second power enters into the equation, it is said to be of the *second degree*: and when the third power or cube enters, it is of the *third degree*; and so on.

Every indeterminate equation of the first degree, as

$$! ax \pm by \pm cz \pm d \pm \&c. = 0$$

is solved by means of the more simple equation

$$ap - bq = \pm 1.$$

And every indeterminate equation of the second degree has its solution, if not absolutely depending, at least intimately connected with the solution of the equation

$$p^2 - Nq^2 = \pm 1.$$

Before, therefore, entering upon the general solution of indeterminate problems, it will be proper to consider more particularly the two equations above-mentioned.

PROP. I.

To find the values of x and y , in the equation

$$ax - by = \pm 1.$$

First, it may be observed, that this equation is always possible under either condition of the ambiguous sign \pm , provided that a and b be prime to each other; and without this, the equation is always impossible; because, in that case, the first side of the equation will be divisible by the common divisor of a and b ; whereas the second side, ± 1 , has no divisor; and, consequently, no equality can obtain. But when a and b are prime to each other, the solution may always be obtained by the following rule: Divide the greatest of the two given numbers a and b by the other, and then always the last divisor by the last remainder, as in the usual method of finding the greatest common measure of two numbers, and let the successive quotients arising from this operation be denoted by $\alpha, \beta, \gamma, \delta$, &c. See COMMON MEASURE.

With these quotients, placed in one horizontal row, make the following calculation; and the terms of the last fraction but one will be the values of x and y required; thus

$$\text{quot} \begin{matrix} \alpha & \beta & \gamma & \delta & \&c. \\ \text{frac} \frac{\alpha}{1}, \frac{\alpha\beta+1}{\beta}, \frac{(\alpha\beta+1)\gamma+\alpha}{\gamma\beta+1}, \frac{[(\alpha\beta+1)\gamma+\alpha]\delta}{(\gamma\beta+1)\delta+\beta} \&c. \end{matrix}$$

which may be otherwise expressed in words: thus, having arranged the successive quotients, as above, the first fraction will have α for its numerator, and 1 for its denominator; the second will have $\alpha\beta + 1$ for its numerator, and β for its denominator; and all the other numerators will be found by multiplying the numerator of the last fraction by the following quotient, and adding thereto the preceding numerator, and the denominators are found exactly in the same

manner, as is evident in the foregoing fractions. See RATIO.

Ex. 1.—Find the values of x and y , in the equation $16x - 41y = 1$.

$$\begin{array}{r} \text{First } 16)41(2 \\ \underline{32} \\ 9)16(1 \\ \underline{9} \\ 7)9(1 \\ \underline{7} \\ 2)7(3 \\ \underline{6} \\ 1)2(2 \\ \underline{2} \end{array}$$

quotients 2, 1, 1, 3, 2
fractions $\left\{ \frac{2}{1}, \frac{3}{1}, \frac{5}{2}, \frac{18}{7}, \frac{41}{16} \right.$

Here the last fraction but one is $\frac{18}{7}$, and therefore this gives the values of x and y ; that is, $x = 18$ and $y = 7$, which renders $16x - 41y = 1$, as required.

Ex. 2.—Find the values of x and y , in the equation

$$17x - 15y = -1.$$

$$\begin{array}{r} \text{First } 15)17(1 \\ \underline{15} \\ 2)15(7 \\ \underline{14} \\ 1)2(2 \\ \underline{2} \end{array}$$

Quotients 1, 7, 2
Fractions $\left\{ \frac{1}{1}, \frac{8}{7}, \frac{17}{15} \right.$

Therefore $x = 7$, and $y = 8$, which gives $17x - 15y = -1$.

The demonstration of this rule belongs properly to continued fractions, which the reader will find very ably treated of, in the English edition of Euler's *Algebra*; and in most of the French writers on that subject, particularly in the "Essai sur la Theorie des Nombres, par Legendre."

Having thus shewn the general method of solving the indeterminate equation $ax - by = \pm 1$; it only remains to make a few observations relating to it, and to shew, that one solution being obtained, an infinite number of other solutions may be deduced from the one known case.

In the above examples we found $ax - by = +1$, and $ax - by = -1$, as the questions required; but we are frequently led to the solution $ax - by = +1$, when the question requires -1 , and the contrary; which seems at first to destroy the generality of the rule; but this difficulty is easily surmounted from the following considerations.

Let $ap - bq = +1$, the values of p and q being known, to find, from this equation, the value of x and y , in the equation $ax - by = -1$.

Since $ap - bq = 1$, we have only to make $x = bm - p$, and

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and $y = am - q$, and it is obvious that this substitution will give

$$a(bm - p) - b(am - q) = -1;$$

and here, by means of the indeterminate m an indefinite number of values of x and y may be determined.

If from one known case, as $ap - bq = +1$, the general values of x and y in the same equation $ax - by = +1$ were required; we should only have to make $x = mb + p$, and $y = ma + q$, and we should have still

$$a(mb + p) - b(ma + q) = ap - bq = +1,$$

where, by means of the indeterminate m , an indefinite number of values of x and y may be obtained. We will now illustrate what has been taught by an example, and then proceed to the more general equations; each of which, however, will be found to depend upon the one we have been considering.

Ex. 3.—Find the general values of x and y , in the equation

$$13x - 19y = 1.$$

$$13)19(1$$

$$\underline{13}$$

$$6)13(2$$

$$\underline{12}$$

$$1)6(6$$

$$\underline{6}$$

Quotients $\quad 1, \quad 2, \quad 6$

Fractions $\quad \left\{ \begin{array}{l} \frac{1}{1}, \quad \frac{3}{2}, \quad \frac{19}{13} \end{array} \right.$

we have therefore $p = 3$, and $q = 2$; and this gives

$$13p - 19q = 1.$$

Therefore the general values of x and y are

$$x = 19m + p, \text{ and } y = 13m + q, \text{ or}$$

$$x = 19m + 3, \text{ and } y = 13m + 2.$$

Assuming therefore $m = 0, 1, 2, 3, 4, \&c.$; we have the following values of x and y ,

$$m = 0, \quad 1, \quad 2, \quad 3, \quad 4, \quad 5 \quad \&c.$$

$$x = 3, \quad 22, \quad 41, \quad 60, \quad 79, \quad 98 \quad \&c.$$

$$y = 2, \quad 15, \quad 28, \quad 41, \quad 54, \quad 67 \quad \&c.$$

which series may be continued at pleasure.

If the proposed equation had been $13x - 19y = -1$, then having found $p = 3$, and $q = 2$, as above; we must have made

$$x = 19m - 3; \text{ and } y = 13m - 2;$$

and then, by assuming m as before, we should have

$$m = 0, \quad 1, \quad 2, \quad 3, \quad 4, \quad 5 \quad \&c.$$

$$x = -3, \quad 16, \quad 35, \quad 54, \quad 73, \quad 92 \quad \&c.$$

$$y = -2, \quad 11, \quad 24, \quad 37, \quad 50, \quad 63 \quad \&c.$$

where it may be observed, that the successive values of x and y , in both cases, form a series of arithmetics, and may therefore be continued with great facility.

PROP. II.

To find the general values of x and y , in the equation

$$ax - by = \pm c.$$

In the first place we must have either a and b prime to each other, or if they have a common measure, c must have the same, for otherwise the equation will be impossible; and in this latter case, the whole equation may be divided by that common measure, and thus reduced to one in which a and b

are prime to each other: it will, therefore, only be necessary to consider the quantities a and b as prime to each other. Also, after what has been taught in the foregoing proposition, we may always suppose that we know the case $ap - bq = \pm 1$; it will therefore be sufficient in this place to shew how the general values of x and y , in the equation $ax - by = \pm c$, may be deduced from the known case $ap - bq = \pm 1$.

In the first place it is obvious, that since

$$ap - bq = \pm 1,$$

we shall have

$$acp - bcq = \pm c;$$

but this furnishes only one solution, and in order to have the general values of x and y , we must substitute $x = mb \pm cp$; and $y = ma \pm cq$; which give

$$a(mb \pm cp) - b(ma \pm cq) = \pm c;$$

the ambiguous sign \pm , in the two values of x and y , being $+$ when $ap - bq$ has the same sign with c , but $-$ when it has a contrary one.

Ex. 1.—Find the values of x and y , in the equation

$$9x - 13y = 10.$$

First, in the equation $9p - 13q = \pm 1$, we have $p = 3$, and $q = 2$, which gives $9p - 13q = +1$; and this being the same sign with 10 in the proposed equation, the general values of x and y are

$$\left\{ \begin{array}{l} x = 13m + 3c, \text{ or} \\ x = 13m + 30; \end{array} \right. \text{ and } \left\{ \begin{array}{l} y = 9m + 2c, \text{ or} \\ y = 9m + 20 \end{array} \right.$$

And by assuming here $m = -2, -1, 0, 1, 2, \&c.$ we have the following values of x and y :

$$m = -2, \quad -1, \quad 0, \quad 1, \quad 2, \quad 3 \quad \&c.$$

$$x = 4, \quad 17, \quad 30, \quad 43, \quad 56, \quad 69 \quad \&c.$$

$$y = 2, \quad 11, \quad 20, \quad 29, \quad 38, \quad 47 \quad \&c.$$

each of which values has the required conditions, for

$$9 \cdot 4 - 13 \cdot 2 = 10$$

$$9 \cdot 17 - 13 \cdot 11 = 10$$

$$9 \cdot 30 - 13 \cdot 20 = 10$$

$$9 \cdot 43 - 13 \cdot 29 = 10$$

$$\&c. \quad \&c. \quad \&c.$$

Ex. 2.—Find the values of x and y , in the equation

$$7x - 12y = 19.$$

First in the equation $7p - 12q = -1$, we have $p = 5$, and $q = 3$; where -1 has a different sign from 19 in the proposed equation; therefore the general values of x and y are

$$\left\{ \begin{array}{l} x = 12m - 5 \cdot 19; \\ x = 12m - 95; \end{array} \right. \text{ and } \left\{ \begin{array}{l} y = 7m - 3 \cdot 19, \text{ or} \\ y = 7m - 57 \end{array} \right.$$

where, by taking $m = 9, 10, 11, \&c.$ in order that x and y may be positive, we have

$$x = 13, \quad 25, \quad 37, \quad 49, \quad 61, \quad 73, \quad 85 \quad \&c.$$

$$y = 6, \quad 13, \quad 20, \quad 27, \quad 34, \quad 41, \quad 48 \quad \&c.$$

and in a similar manner may any possible equation $ax - by = \pm c$ be resolved.

PROP. III.

To find the general values of x and y , in the equation

$$ax + by = c.$$

In the foregoing proposition, where the difference of two quantities was the subject of consideration, we found that the number of solutions was infinite, provided that a and b were prime to each other; but in considering the sum of two quantities,

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quantities, as in the present case, the number of solutions is always limited, and in many cases the equation is impossible; it may however be demonstrated, that the equation always admits of at least one solution, if $c > ab - a - b$, a and b being prime to each other; and it is proposed in the present proposition to ascertain the exact number of possible solutions that any equation of this kind admits of in integer numbers, and to point out more accurately the limits of possibility.

The solution of the equation $ax + by = c$, depends, like that in the foregoing proposition, upon the equation $ap - bq = \pm 1$, though its connection with it is not so readily perceived.

Let $ap - bq = 1$; then we have also

$$a \cdot cp - b \cdot cq = c;$$

and it is evident that we shall have the same result if we make

$$x = cp - mb; \text{ and } y = cq - ma;$$

for this also gives

$$a(cp - mb) - b(cq - ma) = c:$$

assuming, therefore, for m such a value, that $cq - ma$ may become negative, while $cp - mb$ remains positive, we shall have

$$a(cp - mb) + b(ma - cq) = c;$$

and consequently $x = cp - mb$; and $y = ma - cq$; but if m cannot be so taken that $cq - ma$ may be negative, while $cp - mb$ remains positive; it is a proof that the proposed equation is impossible in integer numbers. And on the contrary, the equation will always admit of as many integral solutions as there may be different values given to m , such that the above conditions may obtain.

And hence we are enabled to determine *a priori* the number of solutions that any proposed equation of the above form admits of; for since we must have $cp > mb$, and $cq < ma$, the number of solutions will always be expressed by the

greatest integer contained in the expression $\left(\frac{cp}{b} - \frac{cq}{a}\right)$;

as is evident, because m must be less than the first of those fractions, and greater than the second, and therefore, the difference between the integral part of these fractions will express the number of different values of m ; except when

$\frac{cp}{b}$ is a complete integer, or, which is the same, we must con-

sider $\frac{b}{b}$ as a fraction, and reject it, but not $\frac{a}{a}$, the reason

for which is obvious.

Ex. 1.—Required the values of x and y , in the equation

$$9x + 13y = 2000,$$

and the number of possible solutions in integers.

First, in the equation $9p - 13q = 1$, we have at once $p = 3$, and $q = 2$; therefore the number of solutions will be expressed by

$$\frac{2000 \times 3}{13} - \frac{2000 \times 2}{9} = 461 - 444 = 17.$$

And these are readily obtained from the formulæ

$$\begin{cases} x = cp - mb, \text{ or } \\ x = 6000 - 13m; \end{cases} \text{ and } \begin{cases} y = ma - cq, \text{ or } \\ y = 9m - 4000 \end{cases}$$

in which, assuming $m = 445, 446, \&c.$; in order that $9m > 4000$, we shall have the following solutions, each of which is deduced from the preceding one, by adding suc-

cessively 9 to the values of y , and subtracting 13 from those of x ; thus-

$$\begin{array}{rcccccccc} x = & 215, & 202, & 189, & 176, & 163, & 150, & 137 & \&c. \\ y = & 5, & 14, & 23, & 32, & 41, & 50, & 59 & \&c. \end{array}$$

that is;

$$\begin{array}{rcl} 9 \cdot 215 + 13 \cdot 5 & = & 2000 \\ 9 \cdot 202 + 13 \cdot 14 & = & 2000 \\ 9 \cdot 189 + 13 \cdot 23 & = & 2000 \\ 9 \cdot 176 + 13 \cdot 32 & = & 2000 \\ \&c. & \&c. & \&c. \end{array}$$

Ex. 2.—Given the equation $11x + 13y = 190$, to find the number of solutions, and the values of x and y .

First in the equation $11p - 13q = 1$, we have $p = 6$, and $q = 5$; therefore

$$\frac{190 \cdot 6}{13} - \frac{190 \cdot 5}{11} = 87 - 86 = 1;$$

whence it follows that the equation admits of only one integral solution, and this is obtained from the formulæ

$$\begin{cases} x = cp - mb, \text{ or } \\ x = 190 \cdot 6 - 13m; \end{cases} \text{ and } \begin{cases} y = ma - cq, \text{ or } \\ y = 11m - 190 \cdot 5 \end{cases}$$

where, by taking $m = 87$, in order that $ma - cq$ may be positive, we have $x = 9$, and $y = 7$, which gives

$$11 \cdot 9 + 13 \cdot 7 = 190, \text{ as required.}$$

PROP. IV.

To find the values of x, y , and z , and the number of integral solutions of any equation of the form

$$ax + by + cz = d.$$

In the first place we may observe, that if any one or more of the co-efficients a, b , or c , be negative, the number of answers is indefinite. For let b be negative, then the equation may be put under the form

$$ax + cz = by + d;$$

in which, by means of the indeterminate y , an infinite number of values may be given to the second side of the equation; and consequently also to x and z . We need, therefore, only consider equations of the form above given, in which the quantities are all connected with the sign +.

Now in this equation, as in those of the two foregoing propositions, if a, b , and c , have each a common divisor, which d has not, it becomes impossible; but if only two of them, as a and b , have a common measure, the equation is still possible, as we shall see in what follows.

The solution of the equation,

$$ax + by + cz = d,$$

is resolved by means of the equation

$$ap - bq = \pm 1,$$

as we have seen is the case in the preceding examples. For let one of the three terms, as cz , be transposed to the other side of the equation; then we have

$$ax + by = d - cz,$$

in which the values of x and y , determined as in the last proposition, will be

$$x = (d - cz)p - mb;$$

and $y = ma - (d - cz)q$, that is, by only substituting $d - cz$ instead of c , which is the only respect in which this equation differs from that in the foregoing problem: and here the only limits to be observed are,

1st, $cz < d$; 2d, $mb < (d - cz)p$; 3d, $ma > (d - cz)q$ by attending to which, all the possible values of x and y may

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may be obtained. But as these questions generally admit of a great number of solutions, the object of enquiry is not so much to find the values of the intermediate quantities, as to determine *a priori* the number of them that the equation admits of; and this, therefore, shall form the subject of our future investigation.

Now we have seen, that in the equation

$$ax + by = c,$$

the number of solutions is generally expressed by

$$\frac{cp}{b} - \frac{cq}{a},$$

p and q being first determined by the equation

$$ap - bq = 1.$$

If, therefore, in the equation

$$ax + by = d - cz,$$

we make successively $z = 1, 2, 3, 4, \&c.$ the number of solutions for each value of z will be as below; *viz.*

$$ax + by = d - c, \text{ number of solutions } \frac{(d-c)p}{b} - \frac{(d-c)q}{a}$$

$$ax + by = d - 2c \dots \dots \dots \frac{(d-2c)p}{b} - \frac{(d-2c)q}{a}$$

$$ax + by = d - 3c \dots \dots \dots \frac{(d-3c)p}{b} - \frac{(d-3c)q}{a}$$

$$\&c. \quad \&c. \quad \quad \quad \&c. \quad \&c.$$

the sum of which will be the total number that the given equation admits of; and therefore, in order to find the exact number of solutions in any equation of this kind, we must first ascertain the sum of all the integral parts of the arithmetical series

$$\left\{ \frac{(d-c)p}{b} + \frac{(d-2c)p}{b} + \frac{(d-3c)p}{b} + \frac{(d-4c)p}{b} + \&c; \text{ and } \frac{(d-c)q}{a} + \frac{(d-2c)q}{a} + \frac{(d-3c)q}{a} + \frac{(d-4c)q}{a} + \&c; \text{ and } \right.$$

the difference of the two will be the exact number of integral solutions.

Now in both these series, we know the first and last term, and the number of terms; for the general term being

$$\frac{(d-cz)p}{b}, \text{ and } \frac{(d-cz)q}{a},$$

we shall have the extreme terms by taking the extreme limits of z , that is $z = 1$, and $z < \frac{d}{c}$; which last value of z

also expresses the number of terms in the series.

Hence then, having the elements of the progressions given, the sum of the whole series is readily obtained; and if therefore we also find the sum of the fractional parts in each, we shall have, by deducting it from the whole sums, that of the integral part of the series as required. The latter part of this problem is readily effected, for the denominator in each term being constant, the fractions will necessarily recur in periods; and the number in each can never exceed the denominator: it will therefore only be necessary to find the sum of the fractions in one period, which being multiplied by the number of periods, will give the sum of the fractional part of the terms; and these taken from the total sum, will give the sum of the integral part of the series; and then, from what has been before observed, the difference of the two sums will be the number of integral solutions required. It may also be ob-

served, that when the number of terms do not consist of an exact number of periods of circulation, the remaining terms or fractions must be summed by themselves, which is also readily effected, as they will be the same as the leading terms of the first period; and it must also be remembered,

that $\frac{b}{a}$ is to be considered as a fraction in the first series;

but not $\frac{a}{a}$ in the second, as is explained in the foregoing proposition.

Ex. 1.—Given $5x + 7y + 11z = 224$, to find the number of solutions that the equation admits of in positive integers.

Here the greatest limit of z is $z < \frac{224}{11} = 20$: also in

the equation $5p - 7q = 1$, we have $p = 3$, and $q = 2$, also $a = 5$, and $b = 7$; and therefore the two series, of which the sums are required, beginning with the least term in each, are

$$\left\{ \begin{array}{l} \frac{3 \cdot 4}{7} + \frac{3 \cdot 15}{7} + \frac{3 \cdot 26}{7} + \frac{3 \cdot 37}{7} + \&c. \dots \frac{3 \cdot 113}{7} \\ \frac{2 \cdot 4}{5} + \frac{2 \cdot 15}{5} + \frac{2 \cdot 26}{5} + \frac{2 \cdot 37}{5} + \&c. \dots \frac{2 \cdot 113}{5} \end{array} \right.$$

the common difference in the first being $\frac{3 \cdot 71}{7}$; and in

the second $\frac{2 \cdot 11}{5}$; also the number of terms in each 20.

Whence we have 930 for the sum of the first;

and 868 for the sum of the second.

Again, the first period of fractions, in the first series, is

$$\frac{5}{7} + \frac{3}{7} + \frac{1}{7} + \frac{6}{7} + \frac{4}{7} + \frac{2}{7} + \frac{7}{7} = 4;$$

and in the second series, the first period of fractions is

$$\frac{3}{5} + 0 + \frac{2}{5} + \frac{4}{5} + \frac{1}{5} = 2;$$

$\frac{7}{7}$ being considered as a fraction in the first, but not

$\frac{5}{5}$ in the second.

Now the number of terms in each series being 20, we have 2 periods and 6 terms in the first series $= 2 \times 4 +$ the first 6 fractions $= 11$ for the sum of all the fractions; and therefore $930 - 11 = 919$, which is the exact sum of the integral terms. And in the second, we have 4 periods $= 4 \cdot 2 = 8$, and therefore $868 - 8 = 860$, which is the sum of the integral terms in this; and hence according to the rule

$$919 - 860 = 59;$$

which is the number of integral solutions.

Remark.—Simpson, in his algebra, makes the number of solutions to this question 60; but he has evidently introduced one (*viz.* $x = 10, y = 14$, and $z = 14$), which does not obtain.

Ex. 2.—Having given $7x + 9y + 23z = 9999$, it is required to find the number of its solutions in positive integers.

Here the greatest limit of $z < \frac{9999}{23} = 434$; also in the equation $7x - 9p = 1$, we have $p = 4$, and $q = 3$,
 $a = 7$,

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$a = 7$, and $b = 9$; also $9999 - 23 \cdot 434 = 17$; therefore the series whose sums are required, will be

$$1st. \frac{4 \cdot 17}{9} + \frac{4 \cdot 40}{9} + \frac{4 \cdot 63}{9} + \&c. \dots \frac{4 \cdot 9976}{9}$$

$$2d. \frac{3 \cdot 17}{7} + \frac{3 \cdot 40}{7} + \frac{3 \cdot 63}{7} + \&c. \dots \frac{3 \cdot 9976}{7}$$

the common difference in the first being $\frac{4 \cdot 23}{9} = 10 \frac{2}{9}$;

and in the second $\frac{3 \cdot 23}{7} = 9 \frac{6}{7}$; also the number of terms in each 434; that being the greatest limit of z .

Hence we have the sum of the first series $= 963769 \frac{3}{9}$

and of the second $= 929349$

Also the first period of fractions in the first series, is

$$\frac{5}{9} + \frac{7}{9} + \frac{9}{9} + \frac{2}{9} + \frac{4}{9} + \frac{6}{9} + \frac{8}{9} + \frac{1}{9} + \frac{3}{9} = 5;$$

and $\frac{434}{9} = 48$ periods, and 2 terms $= 5 \cdot 48 + \frac{5}{9} + \frac{2}{9} = 241 \frac{3}{9}$

And in the second series, the first period of fractions is

$$\frac{2}{7} + \frac{1}{7} + 0 + \frac{6}{7} + \frac{5}{7} + \frac{4}{7} + \frac{3}{7} = 3;$$

also $\frac{434}{7} = 62$ periods; and therefore $62 \cdot 3 = 186$.

Hence $963769 \frac{3}{9} - 241 \frac{3}{9} = 963528$ integral terms

and $929349 - 186 = 929163$ integral terms

whence the difference 34365 is the number of integral solutions required.

In the foregoing examples we have had two of the terms prime to each other; but when this is not the case the following transformation will be necessary.

Ex. 3.—Let there be proposed the equation,

$$12x + 15y + 20z = 100001,$$

to find the number of solutions.

Here no two of the co-efficients are prime to each other, and we must therefore proceed as follows.

Divide the whole equation by 3, and transpose z , and we have

$$4x + 5y = 33334 - 7z + \frac{z-1}{3}$$

which last must be an integer; make therefore $\frac{z-1}{3} = u$,

and we have $z = 3u + 1$; substituting now this value of z , the original equation becomes

$$12x + 15y + 20(3u + 1) = 100001;$$

or, dividing by 3,

$$4x + 5y + 20u = 33327,$$

the number of solutions in which will be the same as in the equation proposed, which will be found as in the foregoing examples, except that here the least value of $u = 0$, because we shall then, still have $z = 1$, and by proceeding as in the preceding examples, it will be found that the number of integral solutions that may be given to this question, amounts to no less than 1388611.

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PROP. V.

Having given any number of equations, less than the number of unknown quantities that enter therein, to determine those quantities.

Let there be proposed the two equations

$$\begin{cases} ax + by + cz = d \\ a'x + b'y + c'z = d' \end{cases}$$

to find the values of x , y , and z .

Multiply the first by a' , and the second by a , whence, by subtraction, we obtain

$$(a'b - a'b')y + (a'c - ac')z = a'd - ad'$$

Or, dividing each of these known co-efficients by their greatest common divisor, if they have any, and representing the results by b'' , c'' , and d'' , this equation becomes

$$b''y + c''z = d''.$$

Find now the values of y and z in this equation; and these being substituted for them in the equation

$$x = \frac{d - cz - by}{a}$$

will give the corresponding values of x , of which those, of course, must be rejected that render x fractional, and also those that give $(cz + by) > d$.

Ex.—Given the equations

$$\begin{cases} 3x + 5y + 7z = 560 \\ 9x + 25y + 49z = 2920 \end{cases}$$

to find all the integral values of x , y , and z .
Multiplying the first by 3, we have

$$\begin{cases} 9x + 15y + 21z = 1680 \\ 9x + 25y + 49z = 2920 \end{cases}$$

whence

$$\begin{cases} 10y + 28z = 1240, \text{ or} \\ 5y + 14z = 620 \end{cases}$$

And here the values of y and z are found to be

$$y = 110, 96, 82, 68, 54, 40, 26, 12$$

$$z = 5, 10, 15, 20, 25, 30, 35, 40$$

and of these, the only two that give

$$x = \frac{560 - 7z - 5y}{3}$$

an integer, are as follows,

$$\begin{cases} z = 15, y = 82, x = 15 \\ z = 30, y = 40, x = 50 \end{cases}$$

which are the only two solutions the equations admit of in integers.

The method above given will never fail of producing all the possible solutions in equations of the above form; but there are other methods that may be followed in particular cases which sometimes shorten the operations. These the reader will find explained in vol. ii. of Euler's Elements of Algebra.

PROP. VI.

To decompose a given numeral fraction, having a composite denominator, into a number of simple fractions having prime denominators.

This is, in fact, only an application of the foregoing propositions to this particular problem; for let $\frac{m}{n}$ be the given fraction; and suppose, in the first instance, that its

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denominator consists of two prime factors, or $n = ab$, it will then be to find

$$\frac{m}{ab} = \frac{p}{a} + \frac{q}{b}, \text{ or } aq + bp = m,$$

in which equation, having determined the values of p and q , we shall have $\frac{p}{a} + \frac{q}{b}$ for the fractions required; and as many different ways may any such fraction be decomposed into two others, as the equation $aq + bp = m$ admits of integral solutions. If the given fraction be $\frac{m}{abc}$, then we may first resolve it into two fractions, and one of these into two others; thus, let

$$\frac{m}{abc} = \frac{p}{ab} + \frac{q}{c};$$

then we have

$$acq + cp = m;$$

and having, from this equation, found the values of p and q ,

$$\text{we shall have } \frac{m}{abc} = \frac{p}{ab} + \frac{q}{c}.$$

Again, let $\frac{p}{ab} = \frac{r}{a} + \frac{s}{b}$, or as $+rb = p$, find r and s in this equation, so shall we have

$$\frac{m}{abc} = \frac{r}{a} + \frac{s}{b} + \frac{q}{c},$$

as required; and in the same manner may any fraction that admits of decomposition be resolved into others of which the sum shall be equal to the original fraction.

Ex.—What are those two fractions whose sum is equal to $\frac{19}{35}$.

Since $35 = 5 \times 7$, we may make $\frac{19}{35} = \frac{p}{7} + \frac{q}{5}$, which produces this equation,

$$5p + 7q = 19,$$

in which the value of $p = 1$, and $q = 2$ are readily found;

and therefore the fractions sought are $\frac{1}{7} + \frac{2}{5} = \frac{19}{35}$.

PROP. VII.

To find the least number, that, being divided by given numbers, shall leave given remainders.

Let N represent the required number, such that, being divided by a, a', a'' &c. the remainders shall be respectively b, b', b'' , &c. that is,

$$N = am + b = a'n + b' = a''p + b'' \text{ \&c.}$$

and it is required to find the least value of N , that answers these conditions.

$$\begin{array}{l} \text{First since} \quad am + b = a'n + b' \\ \text{we have} \quad am - a'n = b' - b. \end{array}$$

Find, therefore, in this equation, the least values of m and n by Prop. II., then will $am + b$, or $a'n + b'$, express the least number that fulfils the first two conditions. Let now this number be called c ; then it is evident that every number of the form $a'a'q + c$ will also fulfil these conditions; and we must proceed to find $a'a'q + c = a''p + b''$; or,

$$a'a'q - a''p = b'' - c;$$

that is, the least value of p and q in this equation; so shall we have $a'a'q + c$ for the least number that answers the

first three conditions, and so on for as many others as may be proposed.

Ex.—Find the least number, that, being divided by 28, 19, and 15, shall leave for remainders respectively 19, 15, and 11.

Here we have $28m + 19 = 19n + 15 = 15p + 11$. Now, in the equation $28m - 19n = -4$, the least values of m and n are $m = 8$, and $n = 12$; whence $28m + 19 = 19n + 15 = 243$; and it now remains to find $28 \cdot 19q + 243 = 15p + 11$; or, $532q - 15p = -228$.

In which equation $p = 512$, and $q = 14$, whence $532q + 243 = 15p + 11 = 7691$, which is the least number having the required conditions.

Having thus treated of the solution of indeterminate equations of the first degree, to as great an extent as our limit will admit of, we shall proceed to those, in which one, at least, of the unknown quantities enter in the square power, which constitute the class of indeterminate equations of the second degree; and as we have seen that every equation of the first class has its solution depending upon that of the equation $ap - bq = \pm 1$; so in those that we are about to investigate, the solution is intimately connected with that of the equation $p^2 - Nq^2 = \pm 1$; this, therefore, is what shall first engage our attention.

PROP. VIII.

To find the integral values of p and q in the equation

$$p^2 - Nq^2 = \pm 1,$$

N being any given number whatever, not a complete square.

In order to obtain the general solution of this equation, which is always possible (at least with the positive sign) we must shew the method of extracting the square root of any number N , not a complete square, in continued fractions; but as this operation belongs properly to the latter subject, we shall only in this place indicate the method, and must refer the reader for the demonstration to vol. ii. of Euler's Algebra, and to Barlow's Elementary Investigations. See also SQUARE ROOT.

The transformation of the \sqrt{N} , to continued fractions, is performed by means of the following formula.

Let a be the greatest integer contained in \sqrt{N} ; then make

$\begin{array}{l} \frac{\sqrt{N+0}}{1} = a \\ \frac{\sqrt{N+m}}{n} = u \\ \frac{\sqrt{N+m'}}{n'} = u' \\ \frac{\sqrt{N+m''}}{n''} = u'' \\ \text{\&c.} \quad \text{\&c.} \end{array}$	$\begin{array}{l} a - 0 = m; \quad \frac{N - m^2}{1} = n \\ un - m = m'; \quad \frac{N - m'^2}{n} = n' \\ u'n' - m' = m''; \quad \frac{N - m''^2}{n'} = n'' \\ u''n'' - m'' = m'''; \quad \frac{N - m'''^2}{n''} = n''' \\ \text{\&c.} \quad \text{\&c.} \end{array}$
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In these formulæ u, u', u'' , &c. are the greatest integers contained in the corresponding fractions, which quantities are the quotients, whence the converging fractions are to be deduced, by the same rule as is given in Prop. I. for the quotients $\alpha, \beta, \gamma, \delta$, &c.; and by continuing the above operations, we shall be finally led to a quotient equal to $2a$, at which term we must stop, and the corresponding fractions to the last quotient before this will give the required values of p and q .

Ex.

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Ex. 1.—Required the values of p and q in the equation

$$p^2 - 19q^2 = -1.$$

By the above rule,

$\frac{\sqrt{19+0}}{1} = 4 = a$	$4 \cdot 1 - 0 = 4$	$\frac{19-4^2}{1} = 3$
$\frac{\sqrt{19+4}}{3} = 2 = u$	$3 \cdot 2 - 4 = 2$	$\frac{19-2^2}{3} = 5$
$\frac{\sqrt{19+2}}{5} = 1 = u'$	$5 \cdot 1 - 2 = 3$	$\frac{19-3^2}{5} = 2$
$\frac{\sqrt{19+3}}{2} = 3 = u''$	$2 \cdot 3 - 3 = 3$	$\frac{19-3^2}{2} = 5$
$\frac{\sqrt{19+3}}{5} = 1 = u'''$	$5 \cdot 1 - 3 = 2$	$\frac{19-2^2}{5} = 3$
$\frac{\sqrt{19+2}}{3} = 2 = u'''$	$3 \cdot 2 - 2 = 4$	$\frac{19-4^2}{3} = 1$
$\frac{\sqrt{19+4}}{1} = 8 = u''''$		

Having thus arrived at the quotient $8 = 2a$, we have only to compute the fractions by the proposition above quoted; thus,

quotients	4,	2,	1,	3,	1,	2,	8
fractions	$\frac{4}{1}$	$\frac{9}{2}$	$\frac{13}{3}$	$\frac{48}{11}$	$\frac{61}{14}$	$\frac{170}{39}$	

which last fraction gives the values of p and q ; that is, $p = 170$, and $q = 39$; for

$$170^2 - 19 \cdot 39^2 = -1, \text{ as required.}$$

Ex. 2.—Find the values of p and q in the equation

$$p^2 - 13q^2 = -1.$$

First,

$\frac{\sqrt{13+0}}{1} = 3$	$3 \cdot 1 - 0 = 3$	$\frac{13-3^2}{1} = 4$
$\frac{\sqrt{13+3}}{4} = 1$	$4 \cdot 1 - 3 = 1$	$\frac{13-1^2}{4} = 3$
$\frac{\sqrt{13+1}}{3} = 1$	$3 \cdot 1 - 1 = 2$	$\frac{13-2^2}{3} = 3$
$\frac{\sqrt{13+2}}{3} = 1$	$3 \cdot 1 - 2 = 1$	$\frac{13-1^2}{3} = 4$
$\frac{\sqrt{13+1}}{4} = 1$	$4 \cdot 1 - 1 = 3$	$\frac{13-3^2}{4} = 3$
$\frac{\sqrt{13+3}}{1} = 6$		

And having thus arrived at the quotient $2a$, or 6 , we have for

quotients	3,	1,	1,	1,	1
fractions	$\frac{3}{1}$	$\frac{4}{1}$	$\frac{7}{2}$	$\frac{11}{3}$	$\frac{18}{5}$

that is, $p = 18$ and $q = 5$, which give

$$18^2 - 13 \cdot 5^2 = -1,$$

as required.

Ex. 3.—Find the values of p and q in the equation

$$p^2 - 17q^2 = -1.$$

First $\frac{\sqrt{17+0}}{1} = 4 = a$ $\left\{ \begin{array}{l} 4 - 0 = 4 \cdot \frac{17-4^2}{1} = 1 \\ \frac{\sqrt{17+4}}{1} = 8 \end{array} \right.$

Here we have, at the first step, arrived at the quotient $2a$, whence the first fraction, $\frac{4}{1}$, is the one sought; for $4^2 - 17 \cdot 1^2 = -1$, as required.

Ex. 4.—Find the values of p and q in the equation

$$p^2 - 14q^2 = 1.$$

First,

$\frac{\sqrt{14+0}}{1} = 3$	$3 \cdot 1 - 0 = 3$	$\frac{14-3^2}{1} = 5$
$\frac{\sqrt{14+3}}{5} = 1$	$5 \cdot 1 - 3 = 2$	$\frac{14-2^2}{5} = 2$
$\frac{\sqrt{14+2}}{2} = 2$	$2 \cdot 2 - 2 = 2$	$\frac{14-2^2}{2} = 5$
$\frac{\sqrt{14+2}}{5} = 1$	$5 \cdot 1 - 2 = 3$	$\frac{14-3^2}{5} = 1$
$\frac{\sqrt{14+3}}{1} = 6$		

Whence we have,

quotients	3,	1,	2,	1
fractions	$\frac{3}{1}$	$\frac{4}{1}$	$\frac{11}{3}$	$\frac{15}{4}$

which gives $15^2 - 14 \cdot 4^2 = 1$, as required.

It will be observed, that in the foregoing examples we have obtained for each only one solution; whereas they all admit of an indefinite number of solutions. Moreover, it does not appear, from the first three examples, how we should have found the values of p and q , if they had been put equal to $+1$ instead of -1 . This shall, therefore, be considered in the following proposition.

PROP. IX.

To find the general values of x and y in the equation $x^2 - Ny^2 = \pm 1$, from one known case $p^2 - Nq^2 = \pm 1$. In the first place it may be demonstrated, but our limits will not allow of it, that the equation $x^2 - Ny^2 = 1$ is always possible for every value of N , providing it be not a complete square; and the values of x and y are always deducible, both from $p^2 - Nq^2 = 1$, and from $p^2 - Nq^2 = -1$; but if the operation above given does not produce the equation $p^2 - Nq^2 = -1$, the equation $x^2 - Ny^2 = -1$ is always impossible. The present problem, therefore, divides itself into three cases; viz. to find the general values of x and y in the equation $x^2 - Ny^2$, under the following conditions:

1st, $x^2 - Ny^2 = 1$, from one known case $p^2 - Nq^2 = 1$
 2d, $x^2 - Ny^2 = 1$, $p^2 - Nq^2 = -1$
 3d, $x^2 - Ny^2 = -1$, $p^2 - Nq^2 = -1$

Case 1.—Resolve $p^2 - Nq^2 = 1$, and $x^2 - Ny^2 = 1$ into

the factors $\begin{cases} (p + q\sqrt{N})(p - q\sqrt{N}) = 1 \\ (x + y\sqrt{N})(x - y\sqrt{N}) = 1 \end{cases}$

then we have also,

$$(p + q\sqrt{N})^m (p - q\sqrt{N})^m = 1;$$

equating these, with the factors in x and y , we have

$$\begin{aligned} (p + q\sqrt{N})^m &= x + y\sqrt{N} \\ (p - q\sqrt{N})^m &= x - y\sqrt{N} \end{aligned}$$

whence $x = \frac{(p + q\sqrt{N})^m + (p - q\sqrt{N})^m}{2}$;

and $y = \frac{(p + q\sqrt{N})^m - (p - q\sqrt{N})^m}{2\sqrt{N}}$;

which values of x and y will always be integral, and will be the general values sought; and these are evidently indefinite in number, because the power m is indefinite.

Case 2.—The same method may be followed here, as in the preceding case, except that the powers must be even,

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In order to convert -1 into $+1$, as is obvious from inspection; and, therefore, the general values of x and y will be

$$\begin{cases} x = \frac{(p + q\sqrt{N})^{2m} + (p - q\sqrt{N})^{2m}}{2} \\ y = \frac{(p + q\sqrt{N})^{2m} - (p - q\sqrt{N})^{2m}}{2\sqrt{N}} \end{cases}$$

Case 3.—Here, again, we have evidently the same result as in the former cases, except that the power m must now be odd for every odd power of $-1 = -1$; therefore,

$$\begin{cases} x = \frac{(p + q\sqrt{N})^{2m+1} + (p - q\sqrt{N})^{2m+1}}{2} \\ y = \frac{(p + q\sqrt{N})^{2m+1} - (p - q\sqrt{N})^{2m+1}}{2\sqrt{N}} \end{cases}$$

Let us now propose an example in each of these three cases.

Ex. 1.—In the equation $p^2 - 14q^2 = 1$, we have $p = 15$ and $q = 4$, to find a second value of p and q , or of x and y , in the equation $x^2 - 14y^2 = 1$.

Make

$$\begin{cases} x = \frac{(15 + 4\sqrt{14})^2 + (15 - 4\sqrt{14})^2}{2} = 449 \\ y = \frac{(15 + 4\sqrt{14})^2 - (15 - 4\sqrt{14})^2}{2\sqrt{14}} = 120 \end{cases}$$

which give $449^2 - 14 \cdot 120^2 = 1$; and other values may be found by assuming any other power above the second.

Ex. 2.—Given $p = 4$, and $q = 1$, in the equation $p^2 - 17q^2 = -1$, to find the values of x and y , in the equation $x^2 - 17y^2 = 1$.

Here we have, again,

$$\begin{cases} x = \frac{(4 + \sqrt{17})^2 + (4 - \sqrt{17})^2}{2} = 33 \\ y = \frac{(4 + \sqrt{17})^2 - (4 - \sqrt{17})^2}{2\sqrt{17}} = 8 \end{cases}$$

whence $33^2 - 17 \cdot 8^2 = 1$; and other values may be found by assuming any other even power instead of the second.

Ex. 3.—Given $p = 4$, and $q = 1$, in the equation $p^2 - 17q^2 = 1$, to find the values of x and y , in the equation $x^2 - 17y^2 = -1$.

Assume

$$\begin{cases} x = \frac{(4 + \sqrt{17})^3 + (4 - \sqrt{17})^3}{2} = 268 \\ y = \frac{(4 + \sqrt{17})^3 - (4 - \sqrt{17})^3}{2\sqrt{17}} = 67 \end{cases}$$

whence, $268^2 - 17 \cdot 67^2 = -1$, and other values may be obtained, by assuming other odd powers instead of the third.

PROP. X.

To ascertain the possibility or impossibility of every equation of the form $x^2 - Ny^2 = \pm A$; and to find x and y in the former case, A being $< \sqrt{N}$.

The rule for this purpose, is to convert \sqrt{N} into a series of quotients, as in Prop. VIII.; and if A be found in the denominator of any of the quotients, that is, if A be found amongst any of the numbers, which in the proposition above quoted are represented by $n, n', n'', \&c.$ the equation is possible, and the converging fraction corresponding to the quotient preceding this will give the values of x and y ;

but if A be not so found, then is the equation impossible. This theorem cannot be demonstrated in this place, as it belongs to the theory of continued fractions, and the reader is therefore referred for a proof of the rule to Le Gen-dre's *Essai sur la Théorie des Nombres*.

Ex. 1.—Required the values of x and y , in the equation

$$x^2 - 23y^2 = 2.$$

Here by the rule Prop. VIII.

$$\begin{array}{l|l} \frac{\sqrt{23} + 0}{1} = 4 & 1 \cdot 4 - 0 = 4; \quad \frac{23 - 4^2}{1} = 7 \\ \frac{\sqrt{23} + 4}{7} = 1 & 7 \cdot 1 - 4 = 3; \quad \frac{23 - 3^2}{7} = 2 \\ \frac{\sqrt{23} + 1}{2} = 3 & \end{array}$$

Having thus arrived at the denominator 2, it follows that the equation is possible, and the values of x and y are found from the same calculation as at Prop. VIII.; thus

$$\begin{array}{l} \text{quotients} \quad 4, \quad 1, \quad 3 \\ \text{fractions} \quad \left\{ \begin{array}{l} \frac{4}{1}, \quad \frac{5}{1} \end{array} \right. \end{array}$$

whence $x = 5$, and $y = 1$, which gives $x^2 - 23y^2 = 2$.

Ex. 2.—Required the values of x and y , in the equation

$$x^2 - 19y^2 = 5.$$

First

$$\begin{array}{l|l} \frac{\sqrt{19} + 0}{1} = 4 & 1 \cdot 4 - 0 = 4; \quad \frac{19 - 4^2}{1} = 3 \\ \frac{\sqrt{19} + 4}{3} = 2 & 3 \cdot 2 - 4 = 2; \quad \frac{19 - 2^2}{3} = 5 \\ \frac{\sqrt{19} + 2}{1} = 1 & \end{array}$$

Having therefore found the denominator 5, the equation is possible, and we have

$$\begin{array}{l} \text{quotients} \quad 4, \quad 2, \quad 1 \\ \text{fractions} \quad \left\{ \begin{array}{l} \frac{4}{1}, \quad \frac{9}{2} \end{array} \right. \end{array}$$

whence $x = 9$, and $y = 2$, which gives $9^2 - 19 \cdot 2^2 = 5$, as required.

Ex. 3.—It is required to ascertain the possibility, or impossibility, of the equations

$$\begin{cases} x^2 - 17y^2 = \pm 2 \\ x^2 - 17y^2 = \pm 3 \end{cases}$$

First

$$\begin{array}{l|l} \frac{\sqrt{17} + 0}{1} = 4 & 1 \cdot 4 - 0 = 4; \quad \frac{17 - 4^2}{1} = 1 \\ \frac{\sqrt{17} + 4}{1} = 8 & 1 \cdot 8 - 4 = 4; \quad \frac{17 - 4^2}{1} = 1 \\ \frac{\sqrt{17} + 4}{1} = 8 & 1 \cdot 8 - 4 = 4; \quad \frac{17 - 4^2}{1} = 1 \end{array}$$

whence it follows, that since only 1 enters into the denominators of these quotients, no one of the proposed equations is possible.

Cor.—By means of this proposition, we may demonstrate generally the impossibility of all equations falling under any of the following forms;

$$\begin{aligned} x^2 - (a + 1)y^2 &= \pm A \\ x^2 - (a' - 1)y^2 &= \pm A \\ x^2 - (a' + a)y^2 &= \pm A \\ x^2 - (a' - a)y^2 &= \pm A \end{aligned}$$

in which $A > 1$, and $< a$.

Cor.

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Cor. 2.—It is also deducible from similar principles, that the following equations are always possible; N being a prime number, of the form placed opposite the respective equations.

$$\begin{array}{lcl} x^2 - N y^2 = -1 & \text{possible when } N \text{ of the form} & 4n + 1 \\ x^2 - N y^2 = -2 & \dots\dots\dots N \dots\dots\dots & 8n + 3 \\ x^2 - N y^2 = 2 & \dots\dots\dots N \dots\dots\dots & 8n - 1 \end{array}$$

And in a similar manner, are deduced the three following theorems:

1. If M and N be both of the form $4n + 3$, and not equal to each other, the equation

$$M x^2 - N y^2 = \pm 1$$

is always possible in integer numbers: that is, under one or other of the signs $+$ or $-$.

2. If M and N be both of the form $4n + 1$; then one of the equations

$$\begin{cases} x^2 - M N y^2 = -1, \text{ or} \\ M x^2 - N y^2 = \pm 1 \end{cases}$$

will always be resolvable in integers.

3. If M and M' be two prime numbers of the form $4n + 3$, and N a prime number of the form $4n + 1$, it will be always possible to satisfy one of the equations

$$\begin{cases} N x^2 - M M' y^2 = \pm 1 \\ M x^2 - M' N y^2 = \pm 1 \\ M' x^2 - M N y^2 = \pm 1 \end{cases}$$

PROP. XI.

To find the general values of x and y in the equation

$$x^2 - N y^2 = \pm A$$

from one known case $p^2 - N q^2 = \pm A$.

Find the values of m and n in the equation $m^2 - N n^2 = 1$, by Prop. VIII.; then it is evident that the product

$$(p^2 - N q^2) \times (m^2 - N n^2) = \pm A;$$

and it will be found, upon the development of the following formulæ, that

$$(p^2 - N q^2) \times (m^2 - N n^2) = \begin{cases} (pm + Nqn)^2 - N(pn + qm)^2 \\ (pm - Nqn)^2 - N(pn - qm)^2 \end{cases}$$

we have, therefore, only to make,

$$\begin{cases} x = pm + Nqn \\ y = pn + qm \end{cases} \text{ or } \begin{cases} x = pm - Nqn \\ y = pn - qm \end{cases}$$

and having before shewn how to find the general values m and n in the equation $m^2 - N n^2 = 1$; it is obvious, that by means of these formulæ we may derive different values of x and y , in the proposed equation, to any extent at pleasure.

Cor.—It appears also from this proposition, that if the rule in the foregoing one give $p^2 - N q^2 = -A$, when the equation proposed be $+A$; that this may be converted to the latter sign by means of the equation

$$m^2 - N n^2 = -1.$$

Ex. 1.—Given the values of p and q , in the equation $p^2 - 7 q^2 = 2$; viz. $p = 3$, and $q = 1$, to find the general values of x and y , in the equation $x^2 - 7 y^2 = 2$.

First in the expression $m^2 - 7 n^2 = 1$, we have $m = 8$, and $n = 3$; whence by the above formulæ is obtained

$$\begin{cases} x = pm \pm Nqn = 3 \cdot 8 \pm 7 \cdot 1 \cdot 3 = 3 \text{ or } 45 \\ y = pn \pm qm = 3 \cdot 3 \pm 1 \cdot 8 = 1 \text{ or } 17 \end{cases}$$

so that the second values of x and y are, $x = 45$, and $y = 17$; which give $45^2 - 7 \cdot 17^2 = 2$. And assuming these again as new values of p and q , other values x and y may be found *in infinitum*; or the original values of p and q may

be retained, and new values found for m and n , which answers the same purpose.

Ex. 2.—Find the general values of x and y , in the equation $x^2 - 11 y^2 = 5$; the known case being $p^2 - 11 q^2 = 5$, or $p = 4$, and $q = 1$.

In the equation $m^2 - 11 n^2 = 1$, we have $m = 10$, and $n = 3$, therefore by the formulæ

$$\begin{cases} x = pm \pm Nqn = 4 \cdot 10 \pm 11 \cdot 1 \cdot 3 = 7 \text{ or } 73 \\ y = pn \pm qm = 4 \cdot 3 \pm 1 \cdot 10 = 2 \text{ or } 22 \end{cases}$$

that is $x = 7$, and $y = 2$, are two new values of x and y , as are also $x = 73$, and $y = 22$; for each of these give

$$\begin{cases} 7^2 - 11 \cdot 2^2 = 5 \\ 73^2 - 11 \cdot 22^2 = 5 \end{cases}$$

and in the same manner, other values may be found to any required extent.

As our limits will not allow of a very full and explicit investigation of the several elegant rules that have been introduced into the indeterminate analysis by Euler, Lagrange, Legendre; and other distinguished mathematicians; we must refer the reader for the investigation of the methods employed in the following propositions to the authors above-mentioned, and must content ourselves with barely stating the operations, without entering into the demonstration of the theorems themselves.

PROP. XII.

Every indeterminate equation of the second degree falls under the general formula

$$ax^2 + bxy + cy^2 + dx + ey + f = 0,$$

and this may always be transformed to the more simple form

$$u^2 - At^2 = B.$$

The method of performing this transformation will be seen from the following partial example, and the formulæ we have given it being universally the same in all cases.

Assume $bd - 2ace = g$; $d^2 - 4acf = h$; $(by + d)^2 - 4a(cy^2 + ey + f) = t$; $b^2 - 4ac = A$; $Ay + g = u$; $g^2 - Ab = B$.

Then it will be found, by the development of these expressions, that

$$ax^2 + bxy + cy^2 + dx + ey + f = u^2 - At^2 - B = 0,$$

becomes $u^2 - At^2 = B$.

And having found the values of u and t in this last equation, those of x and y are readily derived in the equation proposed.

For $y = \frac{u - g}{A}$, and $x = \frac{t - d - by}{2a}$;

or, substituting for y in the last, we have the following values;

$$\begin{cases} y = \frac{u - g}{b^2 - 4ac} \\ x = \frac{(t - d)(b^2 - 4ac) - (u - g)b}{2a(b^2 - 4ac)} \end{cases}$$

Ex. 1.—Transform the equation

$$3x^2 + 8xy - 3y^2 + 2x - 5y = 110$$

to its simplest form.

Here $a = 3$, $b = 8$, $c = -3$, $d = 2$, $e = -5$, $f = -110$.

Whence

$$\begin{cases} b^2 - 4ac = A = 100 \\ bd - 2ace = g = 46 \\ d^2 - 4acf = h = 1324 \\ g^2 - Ab = B = -130284 \end{cases}$$

and

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and thus the reduced equation becomes

$$u^2 - 100t^2 = -130284.$$

In which, having found $u = 346$, and $t = 50$,

we have
$$\begin{cases} y = \frac{u - g}{A} = \frac{346 - 46}{100} = 3, \\ x = \frac{t - by - d}{2a} = \frac{50 - 8 \cdot 3 - 2}{6} = 4, \end{cases}$$

therefore $x = 4$, and $y = 3$, are the values of x and y in the original equation.

It will be observed that we have employed here the most general form that equations of this kind admit of, and therefore the formulæ are more complex than they usually occur in practical cases, for when any of the co-efficients a , b , c , &c. become zero, the expressions are much simplified, as appears from the following example.

Ex. 2.—Reduce $7x^2 + 5xy + y^2 = 67$ to its simplest form.

Here $a = 7$, $b = 5$, $c = 1$, $d = 0$, $e = 0$, $f = -67$, whence, omitting those quantities that are zero, we have

$$\begin{cases} b^2 - 4ac = A = 29; \text{ and } g = 0 \\ d^2 - 4af = b = 1876 \\ g^2 - Ab^2 = 29 \cdot 1876^2 = B \end{cases}$$

and thus the reduced equation is

$$u^2 - 29t^2 = 29 \cdot 1876^2.$$

And in a similar manner may any indeterminate equation of the second degree be reduced to the form $u^2 - At^2 = B$.

Having therefore shewn the method of reducing every indeterminate equation to the form $u^2 - At^2 = B$; it follows that the solution of this simple form involves with it the solution of every equation of this kind that can be proposed; we shall therefore, in the following proposition, attend to the solution of this particular case. But it may be proper to state, that there are an infinite number of equations of this kind that are impossible; and will admit of no solution, either in integers or fractions; and therefore before we proceed farther in the investigation, it will be useful to lay down a rule, whence their possibility, or impossibility, may be ascertained; as we may thus frequently save much unnecessary labour.

PROP. XIII.

To ascertain the possibility or impossibility of every indeterminate equation of the second degree.

Rule.—Reduce the proposed equation to the form

$$u^2 - At^2 = B,$$

and find all the remainders arising from dividing each of the

squares $1^2, 2^2, 3^2, 4^2$, &c. $\left(\frac{A-1}{2}\right)^2$ by A ;

and also the remainders arising from dividing each of the

squares $1^2, 2^2, 3^2, 4^2$, &c. $\left(\frac{B-1}{2}\right)^2$ by B ;

and again, divide the greatest of these numbers A , B , by the least of them, and observe the remainder.

Then if B be greater than A , this last remainder will be found amongst those of the upper series; and the number A will be found amongst those of the lower series, if the equation be possible.

And conversely, if these conditions have not place, the proposed equation will admit of no solution, either in integers or fractions.

Again, if $A > B$, then the remainder arising from $\frac{A}{B}$ will

be found in the lower series, and the number B in the upper series of remainders, if the equation be possible; and if these conditions have not place, the proposed equation is impossible.

Note.—It is to be observed, that equations falling under the possible form are not always solvable in integers, the proof extending only to their solvability in rational numbers, which may therefore sometimes be fractional; but when they fall under an impossible form, they will admit of no solutions either in integers or fractions.

Ex.—Required the possibility or impossibility of the equation

$$x^2 - 7y^2 = 11$$

squares $1^2, 2^2, 3^2$ divided by 7
remainders 1, 4, 2

squares $1^2, 2^2, 3^2, 4^2, 5^2$ divided by 11
remainders 1, 4, 9, 5, 3

$\frac{11}{7} = 1$ and remainder 4.

Now 4 is found in the upper series of remainders, but 7 is not found in the lower; therefore the equation cannot have place either in integers or fractions.

And for the same reason, the equation $x^2 - 7y^2 = 11z^2$ is also impossible, for if this was possible, so would like-

wise $\frac{x^2}{z^2} - 7 \frac{y^2}{z^2} = 11$; which we have seen is impossible.

Ex. 2.—It is required to ascertain the possibility or impossibility of the equation

$$x^2 - 13y^2 = 12$$

squares $1^2, 2^2, 3^2, 4^2, 5^2, 6^2$ divided by 13
remainders 1, 4, 9, 3, 12, 10

And the same squares, divided by 12, give for

remainders 1, 4, 9, 4, 1, 0

also, $\frac{13}{12} = 1$ and remainder 1.

And here, since 12 is found in the upper series, and 1 in the lower, the equation is solvable.

Note.—If the equation proposed be of the form

$$x^2 - Ay^2 = -B,$$

we must employ, instead of the positive remainders arising from A , the negative remainders of the same, that is, taking the quotients in excess. And if the equation have the form

$$x^2 + Ay^2 = B,$$

then we must employ the negative remainders of B . Having thus given an idea of the method of judging of the possibility of every equation of the form $x^2 - Ay^2 = B$; and having also shewn how any indeterminate of the second degree may be reduced to this form, it only remains to shew the method of solution of the above equation; or, which is still a more general form, of the equation

$$x^2 - Ay^2 = Bz^2;$$

but in this, as in the other propositions, we can only indicate the method, without attempting to investigate the rationale of the operation; as this would carry us much beyond our limits. Now it is shewn under the article DIOPHANTINE, that the

INDETERMINATE ANALYSIS.

the solution of the equation $x^2 - y^2 = Cz^2$ is always to be obtained; and in the following proposition, with which we shall conclude this article, it will be seen that every equation of the form $x^2 - Ay^2 = Bz^2$, which is possible, may be transformed to another of the form $x'^2 - y'^2 = cz'^2$; and that x , y , and z , in the original equation, will be dependent upon those of x' , y' , and z' , in the transformed equation; and therefore these last being known, the former will be known also.

PROP. XIV.

To transform every possible equation of the form $x^2 - Ay^2 = Bz^2$, to another dependent equation of the form $x'^2 - y'^2 = cz'^2$.

Ex. 1.—It is required to transform the equation $x^2 - 5y^2 = 11z^2$, to another of the form $x'^2 - y'^2 = cz'^2$.

Having first ascertained the possibility of the equation by the foregoing proposition, the transformation may be effected in the following manner.

Assume $x = ny - 11y'$, and this substituted for x , gives

$$\left(\frac{n^2 - 5}{11}\right)y^2 - 2nyy' + 11y'^2 = z^2.$$

Take n , so that $n^2 - 5$ may be divisible by 11; that is, let $n = 4$, and our equation becomes

$$y^2 - 8yy' + 11y'^2 = z^2; \text{ or } (y - 4y')^2 - 5y'^2 = z^2$$

or, by making $y - 4y' = x$, we have

$$x'^2 - 5y'^2 = z^2; \text{ or, } x'^2 - z^2 = 5y'^2, \text{ as required,}$$

that is, the equation has been reduced from the form $x^2 - 5y^2 = 11z^2$, to another of the form $x'^2 - y'^2 = cz'^2$, or, at least, to $x'^2 - z^2 = 5y'^2$; which differs from the foregoing only in the letters.

And, by means of the values of x' , y' , and z , in this last, we readily arrive at those of x , y , and z , in the one proposition;

$$\text{for } x' = y - 4y', \text{ or } y = x' + 4y' \\ \text{and } x = ny - 11y', \text{ or } x = 4y - 11y'$$

Now we have seen, under the article DIOPHANTINE, that the general values of x' and z , in equations of the form $x'^2 - z^2 = 5y'^2$, are

$$\begin{cases} x' = p^2 + 5q^2 \\ z = p^2 - 5q^2 \\ y' = 2pq \end{cases}$$

whence we have, for the general values of x , y , and z , in the equation proposed,

$$\begin{aligned} x &= 4p^2 + 20q^2 + 10pq \\ y &= p^2 + 5q^2 + 8pq \\ z &= p^2 - 5q^2 \end{aligned}$$

where p and q may be assumed any numbers at pleasure. If $p = 3$, and $q = 1$, we have $x = 86$, $y = 38$, and $z = 4$; which numbers answer the required conditions; for

$$86^2 - 5 \cdot 38^2 = 11 \cdot 4^2;$$

and by giving different values to p and q , a variety of other integral values may be found for x , y , and z .

Note.—It may happen that the first transformation will not reduce the equation to the form required, in which case we must again transform this anew, and, by continuing the operation, the reduction to the final form will be ultimately effected.

Ex. 2.—Required the values of x , y , and z , in the equation

$$x^2 - 12y^2 = 13z^2.$$

First, we have $x = ny - 13y'$, and substituting for x we have

$$\left(\frac{n^2 - 12}{13}\right)y^2 - 2nyy' + 13y'^2 = z^2;$$

and here $n = 5$, whence the equation becomes

$$y^2 - 10yy' + 13y'^2 = z^2; \text{ or } (y - 5y')^2 - 12y'^2 = z^2$$

Make now $y - 5y' = x'$, and it becomes

$$x'^2 - z^2 = 12y'^2$$

and the general values of x' and z in this equation, are

$$x' = 3p^2 + 4q^2, \quad z = 3p^2 - 4q^2, \quad \text{and } y' = 2pq.$$

Whence, by assuming $p = 2$, and $q = 1$, we have $x' = 16$, $z = 8$, and $y' = 4$; so that in the original equation, the values of x , y , and z , are as follow; viz.

$$\begin{cases} y = x' + 5y' = 36 \\ x = 5y - 12y' = 132 \\ z = z = 8 \end{cases} \text{ or, } \begin{cases} y = 9 \\ x = 33 \\ z = 2 \end{cases}$$

the latter values being formed by dividing the former by their greatest common divisor; and either of these sets of numbers answer the required conditions; for,

$$132^2 - 12 \cdot 36^2 = 13 \cdot 8^2, \text{ and } 33^2 - 12 \cdot 9^2 = 13 \cdot 2^2;$$

and various other values may be obtained by changing the values of p and q .

We will now give one example in which the required reduction does not take place in the first transformation.

Ex. 3.—Required the values of x , y , and z , in the equation

$$x^2 - 5y^2 = 19z^2.$$

Assume, as before, $x = ny - 19y'$: then the substitution of this value for x , gives

$$\left(\frac{n^2 - 5}{19}\right)y^2 - 2nyy' + 19y'^2 = z^2; \text{ in which } n = 10.$$

$$\text{Whence } \begin{cases} 5y^2 - 10yy' + 19y'^2 = z^2, \text{ or } \\ 25y^2 - 50yy' + 95y'^2 = 5z^2 \end{cases}$$

$$\text{Making now, } \begin{cases} 5y - 10y' = x' \\ x - 5y' = 5z^2 \end{cases} \text{ we have}$$

and here, though we have not arrived at the form required, the last co-efficient is reduced from 19 to 5; and thus every successive transformation will reduce the co-efficients, till we ultimately arrive at that of unity; but without pursuing this reduction farther in the present case, we are led to the solution in an easier manner: for we see immediately, that x' may be assumed $= 5$, $y' = 2$, and $z = 1$.

And from these we readily ascertain those of x , y , and z , in the proposed equation; for

$$\begin{cases} y = \frac{x' + ny'}{5}; \text{ or } y = \frac{5 + 10 \cdot 2}{5} = 5 \\ x = ny - 19y'; \text{ or } x = 50 - 38 = 12 \\ z = 1 \end{cases} \text{ ; or } z = 1$$

which give $12^2 - 5 \cdot 5^2 = 19 \cdot 1^2$, as required.

We shall now conclude this article with a synopsis of indeterminate formulæ; the demonstration and application of which the reader will find in Barlow's "Elementary Investigation of the Properties of Numbers."

Synopsis

INDETERMINATE ANALYSIS.

Synopsis of Indeterminate Formulæ.

Form. 1. Equation $ax - by = \pm c$

$$\left\{ \begin{array}{l} \text{General value of } x = m b \pm c q \\ \text{of } y = m a \pm c p \end{array} \right.$$

in which expressions m is indeterminate, and the values of p and q result from the solution of the equation $ap - bq = \pm 1$.

Form. 2. Equation $ax + by = c$

$$\left\{ \begin{array}{l} \text{General value of } x = c q - m b \\ y = m a - c p \end{array} \right.$$

$$\text{Number of solutions} = \frac{c q}{b} - \frac{c p}{a}$$

the quantities p and q being ascertained as above, also m indeterminate.

Form. 3. Equation $ax + by + cz = d$

$$\left\{ \begin{array}{l} \text{General value of } x = (d - cz) q - m b \\ y = m a - (d - cz) p \end{array} \right.$$

the quantities p and q being found as above, also m indeterminate, and z any integer $< \frac{d}{c}$.

Form. 4. Equation $x^2 - ay^2 = z^2$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = p^2 + a q^2 \\ y = 2 p q \\ z = p^2 - a q^2 \end{array} \right.$$

in which expressions a is given, and p and q are indeterminates, that may be assumed at pleasure.

Form. 5. Equation $x^2 + ay^2 = z^2$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = p^2 - a q^2 \\ y = 2 p q \\ z = p^2 + a q^2 \end{array} \right.$$

a being given, and p and q indeterminates as above.

Form. 6. Equations $ax^2 + bxy + y^2 = z^2$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = 2 p q + b q^2 \\ y = p^2 - a q^2 \\ z = p^2 + b p q + a q^2 \end{array} \right.$$

where p and q are indeterminates, and a and b given quantities.

Form. 7. Equation $ax^2 + bx = z^2$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = \frac{b q^2}{p^2 - a q^2} \\ z = \frac{b p q}{p^2 - a q^2} \end{array} \right.$$

where a and b are known quantities, and p and q indeterminates.

Form. 8. Equation $m^2 x^2 + bx + c = z^2$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = \frac{p^2 - c q}{b q - 2 m p q} \\ z = \frac{m p^2 + m c q - b p q^2}{b q^2 - 2 m p q^2} \end{array} \right.$$

where m , b , and c are any given numbers, and p and q indeterminates.

Synopsis of Indeterminate Formulæ.

Form. 9. Equation $ax^2 + bx + m^2 = z^2$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = \frac{b q^2 - 2 m p q}{p^2 - a q^2} \\ z = \frac{m p^2 + a m q^2 - b p q}{p^2 - a q^2} \end{array} \right.$$

where m , a , and b are known; and p and q indeterminates.

Form. 10. Equation $x^2 - N y^2 = \pm 1$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = \frac{(p + q \sqrt{N})^m + (p - q \sqrt{N})^m}{2} \\ y = \frac{(p + q \sqrt{N})^m - (p - q \sqrt{N})^m}{2 \sqrt{N}} \end{array} \right.$$

where p and q arise from the equation $p^2 - N q^2 = \pm 1$, and m is indeterminate; except that it must be even or odd, as the case requires. See Prop. IX.

Form. 11. Equation $x^2 - N y^2 = \pm A$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = p m \pm N q n \\ y = p n \pm q m \end{array} \right.$$

the values of m and n being formed from the equation $m^2 - N n^2 = \pm A$, and p and q from the equation $p^2 - N q^2 = \pm 1$.

Form. 12. Equation $ax^3 + bx^2 + cx + f^2 = z^2$

$$\left\{ \begin{array}{l} \text{Particular val. of } x = \frac{c^2 - 4 b f^2}{4 a f^2} \\ \text{Or, } x = \frac{(8 a f^3 - 4 b f^2 c + c^2) 8 f^2}{(4 b f^2 - c)^2} \end{array} \right.$$

where all the quantities a , b , c , and f are given.

Form. 13. Equation $ax^4 + bx^3 + cx^2 + dx + f^2 = z^2$

$$\left\{ \begin{array}{l} \text{Partic. val. of } x = \frac{(8 b f^4 - 4 c d f^2 + d^2) 8 f^2}{16 c^2 f^2 - 64 a f^4 - 8 c d f^2 + d^4} \end{array} \right.$$

where a , b , c , &c. are all known quantities.

Form. 14. Equation $m^2 x^4 + bx^3 + cx^2 + dx + e = z^2$

$$\left\{ \begin{array}{l} \text{Partic. val. of } x = \frac{16 c^2 m^2 - 64 e m^4 - 8 c b^2 m^2 + b^4}{(8 d m^2 - 4 c b m^2 + b^2) 8 m^2} \end{array} \right.$$

where also m , b , c , &c. are all known quantities.

Form. 15. Equation $m^2 x^4 + bx^3 + cx^2 + dx + f^2 = z^2$

$$\left\{ \begin{array}{l} \text{Particular val. of } x = \frac{d^2 \pm 8 m f^2 - 4 c f^2}{4 b f^2 \mp 4 m d f} \\ \text{Or, } x = \frac{4 m^2 d \pm 4 m b f}{b^2 \mp 8 m^3 f - 4 m^2 c} \end{array} \right.$$

In these expressions m , b , c , &c. are known quantities, and with regard to the ambiguous sign, it must be observed, that when it is taken + in the numerator, it must be - in the denominator, and the contrary.

Form. 16. Equation $ax^3 + bx^2 + cx + f^3 = z^3$

$$\left\{ \begin{array}{l} \text{Particular val. of } x = \frac{(c^2 - 3 b f^2) 9 f^3}{27 a f^3 - c^3} \end{array} \right.$$

a , b , c , &c. being known quantities.

Synopsis of Indeterminate Formulæ.

Form. 17. Equation $m^3 x^3 + b x^2 + c x + d = z^3$.

$$\left\{ \begin{array}{l} \text{Particular val. of } x = \frac{b^3 - 27 d m^6}{(3 c m^3 - b^3) 9 m^3}, \\ \end{array} \right.$$

a, b, c , &c. being given quantities, as above.

Form. 18. Equation $m^3 x^3 + b x^2 + c x + f^3 = z^3$.

$$\left\{ \begin{array}{l} \text{Particular val. of } x = \frac{(c^2 - 3 b f^3) 2 f^3}{27 m^3 f^3 - c^3}, \\ \text{Or,} \quad x = \frac{b^3 - 27 f^3 m^6}{(3 c m^3 - b^3) 9 m^3}, \\ \text{Or,} \quad x = \frac{3 m f^2 - c}{b - 3 m^3 f}, \end{array} \right.$$

where also m, b, c , &c. are known quantities.

Form. 19. Equation $x^3 + a x y + b y^3 = z^3$.

$$\left\{ \begin{array}{l} \text{General val. of } x = t^3 - b t u^2 - a b u^3 \\ y = 3 t^2 u + 3 a t u^2 + (a^3 - b) u^3 \\ z = t^3 + a t u + u^3, \end{array} \right.$$

where t and u may be assumed at pleasure.

Form. 20. Equation $x^2 + b y^2 = z^2$.

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = t^2 - b t u^2 \\ y = 3 t^2 u - b u^3 \\ z = t^2 + u^2, \end{array} \right.$$

x and u being indeterminates, as above.

Form. 21. Equation $x^2 + b y^2 = z^4$.

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = t^4 - 6 b t^2 u^2 + b^2 u^4 \\ y = 4 t^2 u - 4 b t u^3 \\ z = t^2 + b u^2, \end{array} \right.$$

x and u being indeterminates, as above.

Form. 22. Equation $x^3 + b y^3 = z^m$.

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = t^m - \beta t^{m-2} u^2 b + \delta t^{m-4} u^4 b^2 - \&c. \\ y = \alpha t^{m-1} u - \gamma t^{m-3} u^3 b + \epsilon t^{m-5} u^5 b^2 \&c. \\ z = t^3 + b u^2, \end{array} \right.$$

where t and u are indeterminates, and $1, \alpha, \beta, \gamma, \delta$, &c. the coefficients of $(t + u)^m$.

Form. 23. Equation $x^3 + c y^3 = z^2$.

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = 4 t^4 - 4 c t u^3 \\ y = 8 t^3 u + c u^4 \\ z = t^3 + c u^3, \end{array} \right.$$

where t and u are indeterminates.

Form. 24. Equation $x^3 + a x^2 y + b x y^2 + c y^3 = z^2$.

$$\left\{ \begin{array}{l} \text{Partic. val. of } t = -\frac{u^2 + 2 a u w + (a^2 - b) w^2}{2 w} \\ \end{array} \right.$$

$$\left\{ \begin{array}{l} \text{Gen. val. of } x = t^3 + 2 c u w + a c w^2 \\ y = 2 t u - 2 b u w - (a b - c) w^3, \end{array} \right.$$

where u and w are indeterminates, on which also depends the value of t .

INDETERMINATE Problem, is that in which there are more unknown quantities than there are equations; and therefore from the principles of algebra the number of solutions is unlimited, unless some other condition enter, such

as requiring integral values of the unknown quantities, by which means the problem frequently admits of only a definite number of answers; as may be seen in the preceding article. In geometry a problem is always said to be indeterminate, or unlimited, when there are not sufficient data to limit its construction.

INDEX, in *Anatomy*, the fore-finger.

INDEX, in *Arithmetic*, is the same with what is otherwise called the characteristic, or exponent of a logarithm.

The index is that which shews of how many places the absolute number belonging to the logarithm consists, and of what nature it is, whether an integer, or a fraction.

Thus, in this logarithm 2.521293, the number standing on the left hand of the point is called the index; and because it is 2, it shews you that the absolute number answering to it consists of three places; for it is always one more than the index, because the index of 1 is 0; of 10 is 1; and of 100 is 2, &c. And, therefore, in those small tables of Briggs's Logarithms, where the index is omitted, it must be always supplied before you can work by them. If the absolute number be a fraction, the index of the logarithm has a negative sign, and is marked thus, 2.562293; which shews the corresponding number to be a decimal fraction of three places; viz. 1.365.

Mr. Townly has a peculiar way of noting these indices, when they express fractions, now much in use, viz. by taking, instead of the true index, its arithmetical complement to 10; so that he would write the logarithm now mentioned thus: 8.562293.

How indices are to be added and subtracted, see under the article LOGARITHM.

INDEX, in *Musical*, a character usually placed at the end of each line to indicate the first note of the next line. The following is the character W, which the Italians term a *mostra*, the English call it a *direct*.

INDEX of a Book, is that part annexed to a book, referring to the particular matters or passages therein contained.

INDEX of a Globe, is a little style fitted on to the north-pole, and turning round with it, pointing to certain divisions in the hour-circle.

It is sometimes also called *gnomon*. See GLOBE.

INDEX of Relation, in *Algebra*, the same with scale of relation. See SCALE.

INDEX, or *Indice*, is also the denomination of a congregation at Rome, whose business is to examine books, and to put such as they think fit to prohibit the reading and selling of, into an index. See CONGREGATION.

Indices, or *Expurgatory Indices*, denote the name by which the catalogues of prohibited books are called; among which, however, there is this difference, that some are condemned purely and absolutely, and others only *donec corrigantur*, till they be corrected.

Father Paul says, that Philip of Spain was the first who, by a law made in 1558, procured an index to be published of the books condemned by the inquisition of Spain. Pope Paul IV. took the hint, and ordered the congregation of the holy office at Rome to print a second in 1559. But Gretzer, (De Jure Prohib. lib. li. cap. 19.) says, that the index of prohibited books was printed in Italy, by the papal authority, in 1548; and a larger one in 1552; and another larger in 1554. Pius IV. recommended the matter to the council of Trent; the fathers at Trent, after several debates not being able to agree, thought fit to refer the whole affair to the pope, who, with the advice of certain learned prelates,

published an index of the prohibited books, and certain rules, by his letters, in form of a brief. The same Pius IV. in a bull of March 24, 1564, says, that the index was presented to him by order of the synod, that it should not be published before it was approved by him. It was accordingly published by him, with a strict charge that it should be received by all, and the rules prefixed to it observed. Clement VIII. enlarged and confirmed it, together with the rules, and commanded it to be published in 1595. This was called by the name of the Roman index. By the fourth rule, the common reading of the Holy Scriptures is forbid in these words. "Since it is plain by experience, that if the sacred writings are permitted every where, and without difference to be read in the vulgar tongue, men, through their rashness, will receive more harm than good; let the bishop or inquisitor determine, with the advice of the parish priest or confessor, to whom to permit the reading of the bible, translated by Catholic authors in the vulgar tongue, according as they shall judge whether it be most likely that such reading of the scripture may do harm, or tend to the increase of faith and piety. Let them also have the same power as to all other writings. But if any, without such leave, shall presume to read or have them, without first shewing the bible to the ordinaries, he shall not receive the absolution of his sins. And as to all bookfellers, who shall sell the bibles translated into the vulgar tongue, without such leave, or by any other method shall publish them, let them forfeit the price of the books, and let the money be given to pious uses by the bishop; and let them be subject to other punishments; at the pleasure of the said bishop, according to the nature of the offence. As to regulars, they shall not read or buy them, without leave first obtained from their prelates." The tenth rule enjoins several restrictive regulations concerning the printing and publication of books. Hardouin's Concil. tom. x. p. 207, &c.

In pope Clement's catalogue is an extraordinary kind of decree, that all the books of Catholic authors, written since the year 1515, which was the year immediately preceding that in which Luther began to declaim against indulgences, should be corrected; not only by retrenching what is not conformable to the doctrine of Rome, but also by adding what may be judged proper by the correctors.

After this, the duke of Alva procured another to be printed at Antwerp in 1571, which was published by Francis Junius about the year 1586. There were two others published in 1584, and 1612, by the cardinals Quiroga and Sandoval, and several others by the inquisitors and masters of the sacred palace. The most considerable of all the indices is that of Anthony a Sotomayor, supreme president and inquisitor-general in the kingdom of Spain, which was made for all the states subject to the king of Spain, and comprehends all the others. This was published, with the advice of the supreme senate of the general inquisition, in 1640, and reprinted at Geneva in 1667. To this there were many rules prefixed; and to the Geneva edition was added the index of the decrees which were made by the master of the holy palace, by virtue of his office, or by the command of the holy congregation, or by the holy congregations for the indices and holy office, after the before-mentioned index of the council of Trent. The rules of the former indices are explained and confirmed by these; and the fifth rule, which enlarges the fourth of the index of Trent, prohibits not only all bibles in the vulgar tongue, comprehending all except those that are Hebrew, Greek, Latin, Chaldee, Syriac, Ethiopic, Persian, and Arabic; but all parts of them, either printed or manuscript, with all summaries and abridgments

in the vulgar language or tongue. Limborch's Hist. of the Inquisition by Chandler, book ii. chap. 16.

Of the operation of these indices, the authors of the Encyclopædia observe, that there has been hardly any good book of piety or morality in their language which has not been proscribed. Art. Index.

INDEX of the variation and of the inequality of curvature. See VARIATION of curvature.

INDGEH, in Geography, a town of Asiatic Turkey, in Caramania; 12 miles S.W. of Kaisarieh.

INDGEH Su, a town of Asiatic Turkey, in Natolia; 40 miles S.W. of Angura.

INDIA, an extensive country of Asia, which was divided by Ptolemy and the ancient geographers into "India extra Gangem" and "India intra Gangem," or the peninsula beyond the Ganges and that on this side of the Ganges, to which the appellation of India, according to its original etymology, as the country of the people called "Hindoos," properly belongs. (See HINDOOSTAN.) India on this side of the Ganges was bounded, according to Ptolemy, on the W. by the Paropamisus, Arachosia, and Gedrosia; on the N. by mount Imaus; on the E. by the Ganges; and on the S. and partly on the W. by the Indian sea. The gulf into which the Indus discharged itself was called "Canthi-Colpus," and an island in this gulf was named "Barace." The western mouth of the Indus was denominated "Sagapa." Ptolemy enumerates seven mouths of this river under this and the following names; viz. "Ostium Sinthum, Oream, Chariphi, Saparages, Sabalassa, and Lonibare." To the Ganges Ptolemy assigns five mouths, viz. those of "Polura, Ostium Magnum, O. Chambericum, O. Pseudo-stomum, and Antibole." The part of India, which was situated towards the west, was called "Indo-Scythia." India beyond the Ganges had the Ganges on the W., on the N. certain parts of Scythia and Serica; on the E. the country of the Sinae; and to the S. the Indian sea. This, however, is a vague name for wide and various, and till of late very much unknown, regions between Hindoostan and China. The territory thus denominated is rich and extensive, and includes the Birman empire, and the dominions of Pegu, Siam, Laos, Cambodia, Siampa, Cochinchina, Tonquin, and Malacca: which see respectively. See also ARRACAN, ASAM, AVA, and THIBET. For an account of "Hither India," or "India intra Ganges," see HINDOOSTAN and East India COMPANY. For an elaborate account of the "Political History of India, from the introduction of Mr. Pitt's bill, A. D. 1784, to the present date," see Mr. Malcolm's "Sketch." Lond. 1811, 8vo.

INDIA, East, Company, Coins, Silk, &c. See COMPANY, COIN, SILK, &c.

INDIA, SIGISMONDO D', in Biography, a musical composer, who was born at Palermo in Sicily, and flourished about the year 1610. In 1611 he published at Venice two sets of madrigals; and in 1627 a book of motetti, which did not go down the stream of oblivion unnoticed.

INDIAN, in a general sense, denotes any thing belonging to the Indies, East or West.

INDIAN Arrow-root, in Botany. See MARANTA.

INDIAN Bay, in Geography, a bay that lies on the W. side of Bonavilla bay, in Newfoundland.

INDIAN Bread, in Botany. See CASSADA.

INDIAN Corn. See MAIZE.

INDIAN Corn-cars, Petrified, in Natural History. Many of the early writers on extraneous fossils mention ears of Indian corn among their reliquia. Mr. James Parkinson, in his Organic Remains, vol. i. p. 450, shews, that what Emanuel Swedenborg

Swedenborg figured as an ear of Indian corn, is the stem of an unknown plant, which, at pages 424 and 427, is said to belong to the series of vegetable remains inclosed in iron-stone nodules. See plate 14. fig. 4. of W. Martin's *Pet. Derb.*

INDIAN *Cove*, in *Geography*, a harbour on the E. coast of Indian island, in Dusky bay.

INDIAN *Creek*, a creek on the island of Antigua, a little to the west of Standfast point.—Also, a river of Virginia, which runs into the Ohio, N. lat. 40° 25'. W. long. 80° 40'.—Also, a river of Virginia, which runs into the Chesapeake, N. lat. 37° 43'. W. long. 76° 27'.

INDIAN *Cress*, in *Botany*. See TROPÆOLUM.

INDIAN *Corn Falls*, in *Geography*, a cataract in the river St. Mary, about twenty miles from lake Superior. N. lat. 46° 22'. W. long. 84° 25'.

INDIAN *Fig*, in *Botany*. See CACTUS.

INDIAN *Gem*, in *Mineralogy*. See GEM.

INDIAN *God-tree*, in *Botany*. See FICUS.

INDIAN *Head*, in *Geography*, a cape on the E. coast of New Holland, so called by captain Cook from the number of natives who appeared near it as he passed in May 1770. S. lat. 25° 3'. E. long. 123° 56'.

INDIAN *Island*, a small island near the coast of North Carolina, at the mouth of Pamlico sound. N. lat. 35° 23'. W. long. 76° 50'.—Also, an island on the S. part of Dusky bay, on the coast of New Zealand, about four miles in circumference, so called by captain Cook; about four miles from Pickersgill harbour.

INDIAN *Ink*. See INK.

INDIAN *Leaf*, *Malabathrum*, in *Botany*. See TAMALAPATRA.

INDIAN *Mallow*. See SIDA.

INDIAN *Millet*. See HOLCUS.

INDIAN *Oak*. See TECTONA.

INDIAN *Ocean*, in *Geography*. See OCEAN.

INDIAN *Old Town*, a town of America, in Hancock county, state of Maine, situated on an island in Penobscot river, just above the Great Falls, and about sixty miles below the Forks. Here are about 100 families of Roman Catholics, the remains of the Penobscot tribe, and the only Indians who reside in the district of Maine. They are in a thriving state, having obtained from the Provincial congress a tract of land, 12 miles wide, intersected in the middle by the river, and vested with a right of hunting and fishing as far as the mouth of Penobscot bay extends. They have a decent church, and a priest who conducts their religious service.

INDIAN *Reed and Shot*, in *Botany*. See CANNA.

INDIAN *River*, in *Geography*, a river of Delaware, which runs into Rehoboth bay, N. lat. 38° 40'. W. long. 75° 16'.—Also, a small arm of the sea, between Chandlin and Pleasant river, in the district of Maine.—Also, a river on the E. coast of the peninsula of East Florida, rising near the sea-coast, and running from north to south, and forming a kind of inland passage along the coast. It is also called Rio Ays. N. lat. 27° 30'. W. long. 80° 40'.—Also, a town in Suffolk county, Delaware, containing 1547 inhabitants.

INDIAN *Sound*, a gulf or bay on the S. coast of Patagonia, communicating with the Straits of Magellan by St. Jerome's channel.

INDIAN *Town*, a small town of North Carolina, 52 miles from Edenton.

INDIAN *Town Point*, a cape on the east coast of the island of Antigua. N. lat. 17° 15'. E. long. 61° 22'.

INDIAN *Wood*, called also *Jamaica* and *Campeachy Wood*, is taken out of the heart of a large tree growing plentifully

in the isles of Jamaica, Campeachy, &c. used in dyeing, its decoction being very red.

It has been observed, that putting some of this decoction into two bottles, and mixing a little powder of alum with the one, it will become of a very beautiful red, which will hold; the other in a day's time becoming yellow, though both bottles were stopped from the air alike; and that if a little of the same decoction be exposed to the air, it will become as black as ink in the same space of time. See CAMPEACHY *Wood*, BRASIL, and LOGWOOD.

INDIANA, in *Geography*, a territory on the N. W. side of the Ohio, and lately formed a part of the N. W. territory. In January 1801, it was by act of congress erected into a temporary government, with powers and privileges similar to other territorial governments. It lies between the Great Miami river E., the Mississippi W., the Ohio S., and the Illinois N. It is divided into the three following counties:

Counties.	Inhabitants.	Chief Towns.	Inhabitants.
Knox.....	2517	St. Vincennes	714
Randolph.....	1103	Kaskaskias.....	467
St. Clair.....	1255	Kakokia	719
Total	4875		

This territory has a fine soil, adapted to corn, wheat, rye, oats, cotton, hemp, tobacco, &c. The two western counties of Randolph and St. Clair have lately petitioned congress to be annexed to the Upper Louisiana, in the territorial government. On the N. W. bank of the Ohio, about twenty miles southward of the mouth of the Wabash, N. lat. 37° 36', is a remarkable cave, called the "Great Cave," which is one of the most surprising natural curiosities on the Ohio. The entrance is spacious and uniform; the dome is elliptical, and the uniformity continues to its termination in the hill. Morfe.

INDIANA, a territory in Virginia, lying between Ohio river and the Laurel mountain, containing about 3½ millions of acres; of a form nearly triangular, and extending in length from the Pennsylvania line to the waters of the Little Kenhaway.

INDIANA, a new county in the western parts of Pennsylvania, which, with Westmoreland and Armstrong, constitute a district for the choice of three representatives.

INDIANE, a small harbour in the island of Cape Breton.

INDIANS, the name given to the aborigines of America. These people are scattered through the vast extent of the two prodigious continents, and divided into an infinite number of nations and tribes, differing from each other but little in their manners and customs. The Indians are tall and straight in their limbs: their bodies are strong, and adapted to endure much hardship. Their features are regular, but their countenances fierce; their hair long and lank, and the colour of their skins a reddish brown. Their only occupations are hunting and war; agriculture is left to the women, and for merchandize they have no taste. They are hospitable, generous, and good-tempered; but to the enemies of their country they are implacable: no length of time can allay their resentment, nor is any distance of place great enough to protect the object of their revenge. The Indians seem to have no just notion of a Supreme Being, though they maintain the existence of such a Being, eternal and incorruptible, who has power over all, to whom however they pay no worship: but they are exceedingly superstitious; and being desirous to look into futurity, they encourage and support a multitude of diviners, augurs, and magicians, upon whose

decisions and advice they rely in all matters that concern them, whether of health, war, or hunting. Liberty is the darling passion of the Indians; it is this which makes life supportable, and to this they are ready to sacrifice every thing. Some tribes acknowledge a head or king, but he is revered as a father rather than feared as a monarch. He has no guards, no prisons, no officers of justice: in most cases no other qualification is necessary for their chiefs, but age, experience, and ability in conducting their affairs. Every transaction is performed with much ceremony; and to fix the remembrance of them in their minds, they have belts of small shells or beads of different colours, which have all a different meaning, according to their colour or arrangement. These belts are carefully treasured up in each town, and serve as the public records of the nation; and to these they occasionally have recourse when any disputes happen between them and their neighbours.

When the ancients among the Indians have resolved upon a war, they do not declare what nation they mean to attack, nor the time when the attack shall be made, in order that the enemy may be off his guard, and unprepared for defence: but the principal captain summons the youths of the town to which he belongs, the war-kettle is set on the fire, the war-songs and dances begin; the hatchet is sent to all the villages of the same nation, and to all its allies; the fire catches, and the war-songs are heard in all parts. The prime qualities in an Indian war are vigilance and attention, to give and avoid surprize: likewise patience and strength to endure the intolerable fatigues and hardships which always attend it. The fate of their prisoners is the most severe of all: during the greatest part of their journey homewards they suffer no injury; but when they arrive at the territories of the conquering state, or at those of their allies, the people from every village meet them, and think that they show their attachment to their friends by their barbarous treatment of the prisoners. Many writers have asserted that the Indians, even at the maturest stage of their existence, are only furnished with hair on their heads, and that the other parts of the body are always free from it. This, however, is not the truth, for, naturally, their bodies resemble those of the Europeans; but regarding the beard, &c. as deformities, they pluck out each hair by its root, in order to increase their beauty. The men of every Indian nation differ in dress from each other, excepting those who trade with Europeans; these exchange their furs for blankets, shirts, and other apparel, which they wear as much for ornament as necessity. Those among the men who wish to appear gayer than the rest, pluck out the hair from their heads, except from a spot on the top of it, about the size of a crown piece, where it is permitted to grow to a considerable length: on this is fastened a plume of feathers of various colours, with silver or ivory quills. The manner of cutting and ornamenting this part of the head distinguishes different nations from each other. They paint their faces red and black, and their whole bodies when they go to war. Young Indians, who are desirous of excelling their companions in finery, slit the outward rim of both ears, at the same time that they take care not to separate them entirely, but leave the place thus cut still untouched at both extremities; around this spongy substance they twist brass wire, till the weight draws the amputated rim into a bow of five or six inches in diameter, and drags it almost down to the shoulder. It is also a common custom among them to bore their noses, and wear in them pendants of different sorts: sea shells are much worn by those of the interior, and are reckoned ornamental. Indians in general pay greater attention to their dress, and to the ornaments with which they

decorate their persons, than to the accommodation of their huts or tents. They construct the latter in the following method: being provided with poles of a proper length, they fasten two of them across near the ends with bands made of bark: having done this, they raise them up, and extend the bottom of each as wide as they purpose to make the area of the tent: they then erect others of an equal height, and fix them so as to support the two principal ones: over the top they spread the skins of beasts. These tents have neither chimnies nor windows; there is only an aperture left in the middle of the roof, through which the smoke is discharged. They have skins also for beds, generally those of the bear, which are placed in rows on the ground; and if the floor is not large enough to contain beds sufficient for the accommodation of the whole family, a frame is erected a few feet from the ground, in which the younger part of it sleep. As the habitations of the Indians are thus rude, their domestic utensils are few in number, and plain in their formation. The tools with which they fashion them are so awkward and defective, that it is not only impossible to form them with any degree of neatness, but the time required in the execution is so considerable, as to deter them from engaging in the manufacture of those which are not absolutely necessary. All the tribes are now possessed of knives, and steels to strike fire with: these are regarded as essential to the common uses of life, and the Indians usually purchase them with slaves. Indians, by a surprising sagacity, will cross a forest or plain of the greatest extent, and reach with the utmost exactness the place of their destination without any deviation from a direct line. Their memory is very tenacious, their belts of wampum preserve the substance of treaties which they have concluded with the neighbouring tribes for ages back, to which they will appeal with as much readiness and perspicuity as Europeans can to their written records. Every nation pays great respect to the dictates of age. The advice of a father is regarded: but the decisions of a grandfather create in the minds of the young an awe which they cannot withstand: his words are considered and obeyed as oracles. The Indians are fond of gaming, and often stake their arms, their apparel, and every thing of which they are possessed: they are strangers to all distinction of property, except in articles of domestic use, which every one considers as his own, and increases as circumstances admit. They are extremely liberal to each other, and supply the exigencies of those who belong to the same band with their superfluities. Of the value of money the Indians, excepting those who live near the European colonies, have no idea, but consider it as a source of innumerable evils. They are equally indifferent to the productions of art. They are ignorant of the sciences, and seem quite unacquainted with the first principles of astronomy, yet they contrive to divide the time in a rational and perspicuous manner. They count their years by winters, or, as they express themselves, by their snows; and they divide the years by the moons; and on the first appearance of each new moon they repeat some joyful sounds, stretching, at the same time, their hands towards it. Every month has with them a name expressive of its season: that which answers to our March or April, they call the *worm* month, because they observe that at this period the worms quit their retreats in the bark of trees, wood, &c. in which they have sheltered themselves during the winter: they have also the month or moon of flowers; the month of corn; the cold month; the snow month, &c. When the moon does not appear above the horizon, they say the moon is dead, and some call the three last days of each moon "naked days." They have no divisions of weeks, but days they count by sleeps; half days by pointing to the sun at noon, and

and quarters by the rising and setting of the sun ; to express which, in their traditions they make use of hieroglyphics. Their sole knowledge in astronomy consists in being able to point out the polar star, by which they regulate their course when they travel by night. They reckon distances from one place to another by days' journies, each being about 20 miles. They have no knowledge of arithmetic, and though they are able to count to any number, figures and letters appear to carry with them some hidden mystery, and much above their comprehension. Every separate body of Indians is divided into bands or tribes, and forms a little community within the nation to which it belongs. As the nation has some particular symbol by which it is distinguished from others, so each tribe has a badge from which it is denominated, as that of the eagle, the panther, the tiger, the buffalo, &c. Throughout every nation they particularize themselves in the same manner, and the meanest person among them will remember his lineal descent, and distinguish himself by his respective family. Every band has a chief, who is termed the Great Warrior, and who is elected for his warlike qualifications ; besides this there is another who enjoys a pre-eminence as his hereditary right, and has the more immediate management of their civil affairs. When the chiefs are convened on any public business, they always conclude with a feast, at which festivity and cheerfulness know no limits. Dancing is a favourite exercise among the Indians, they never meet on any occasion but this makes a part of the entertainment ; and when they are not engaged in war or hunting, the youth of both sexes amuse themselves in this manner every evening. The Indians have several kinds of dances which they use on different occasions, as the pipe or calumet dance, the war dance, the marriage dance, and the dance of the sacrifice. The movements in every one of these are dissimilar, though it is impossible to give such a description of them as will convey to an European a just idea of the distinctions. Hunting is their principal occupation ; they are trained to it from their youth, and it is an exercise which is esteemed no less honourable than necessary towards their subsistence. A dextrous hunter is held nearly in as high estimation as a distinguished warrior. Scarcely any device which the ingenuity of man has discovered for ensnaring or destroying those animals that supply them with food, or whose skins are valuable to Europeans, is unknown to them. Every hunter prepares himself by fasting during several days : the reason they give for this is, that fasting enables them to dream freely, and in their dreams they are informed where they shall find the greatest plenty of game ; it is thought also to avert the displeasure of evil spirits, and induce them to be propitious. They seem to have some notion of a future state of existence, and suppose that their employments there will resemble those in which they are engaged here, without the labour and difficulty annexed to them in this period of existence. Among those who have priests, these priests are their physicians and their conjurors : they cure their wounds and diseases, interpret their dreams, give them charms which shall render them superior to external danger, and satisfy their curiosity with regard to future events. The Indian is subject to but very few diseases ; the most fatal and destructive is the small-pox, which to them has been the most terrible of all pestilences : this is not, however, continual in their country, as it is in other nations ; frequently there are intervals of many years in which it is never heard of ; but when it prevails, towns and villages are thinned of their inhabitants. An Indian is said to meet death, when it approaches him in his hut, with the same resolution with which he has often faced it in the field. If he is a chief, and has a fa-

mily, he makes a kind of funeral oration, which he concludes by giving to his children necessary advice for the regulation of their conduct. He then takes leave of his friends, and issues out orders for the preparation of a feast, which is designed to regale those of his tribe that come to pronounce his eulogium. After the last struggle the body is dressed in the usual habiliments ; the face is painted, and it is placed in a fitting posture on a mat in the middle of the hut, with his weapons by his side. His relations being seated round, each harangues the deceased body, in turn, and, if he happen to have been a great warrior, recounts his heroic actions. After this, the body is carried to the burying place, where it is interred with other ceremonies. Such are the general characteristics of the Indians ; the peculiarities of each tribe will be found in other parts of the dictionary. The amount of Indian population cannot be precisely ascertained. The newly discovered islands in the South sea, and part of the N. W. coast, are probably the most populous ; as they have suffered less by invaders. The best informed writers have conjectured the number of aboriginal Indians in America to be under $2\frac{1}{2}$ millions. Since the discovery of America, the decrease, in consequence of labour and oppression, famine and pestilence, has been astonishing. A list of Indian tribes, in Imlay's History of Kentucky, makes the aggregate number less than 60,000 of those who inhabit the country, from the gulf of Mexico on both sides of the Mississippi to the gulf of St. Lawrence, and as far west as the country has been generally explored, that is, to the head water of the Mississippi, and from thence a good way up the Missouri, and between that river and Santa Fé. The population of the Indian nations in the southern parts of the United States is given differently from Mr. Imlay's statement by Mr. Purcell, who resided among them in 1780, as follows :

	Gun men:..	Total.
Muscogees, commonly called Creeks	5860	17,280
Chactaws	4131	13,423
Chickasaws	575	2290
Cherokees	2800	8550
Catabaws	150	490
	<hr/> 13,516	<hr/> 42,033

The above red nations have somewhat increased since the general peace established among them in 1777. The whites incorporated among them are few in number, and lead a vagabond life, connecting themselves with one tribe after another. The increase of population is considerably checked by the use of spirituous liquors, and by a certain complaint introduced among them by the whites. In the northern district of North America, Mr. Hutchins, in 1778, estimated the Indians N. of the Ohio, and E. of the Mississippi, at 13,800, and those westward of lake Superior and the Mississippi, at 10,000.

INDICATION, in *Physic*, signifies the pointing out or discovering what is fit to be done, and what means applied in any case, from a knowledge of the nature of the disease, and the virtue of medicines.

Indications are of four kinds : *preservative*, or *prophylactic*, which direct how to cut off the cause of an approaching disease ; *curative*, which shew how to remove a disease actually formed ; *palliative*, which direct how to lessen its effects, or take off some of its symptoms, before it can be wholly removed ; and *vital*, which relate to the strength of the body.

That

That part of phyſic which treats of indications is called *ſemeiotica*.

INDICATIVE, in *Grammar*, the firſt mood or manner of conjugating verbs, ſhewing either the time preſent, paſt, or future, and aſſerting what we think certain; and, therefore, ſometimes called the *declarative* mood.

I love is the preſent tenſe; *I loved*, the paſt; and *I will love* is the future of the indicative mood.

INDICATIVE Column. See **COLUMN**.

INDICATOR, in *Anatomy*, extenſor or abductor indicis, cubito-fus-onguini; a muſcle of the fore-finger, ſituated on the dorsal ſurface of the fore-arm. It is a ſlender muſcle, of an elongated figure, extended from the back of the ulna to the fore-finger. It ariſes, by ſhort aponeurotic fibres, from the poſterior ſurface of the ulna, beginning about the middle of the bone, and having its attachment extended towards the wiſt; and in a ſlight degree from the interoſſeous ligament. It is ſlender and pointed at its origin, grows gradually larger, and then dimin iſhes again and forms a ſmall flattened tendon. From its origin at the middle of the ulna, it paſſes obliquely to the carpal end of the radius, and is confined at the ſurface of that bone in a fibrous ſheath common to it with the extenſor communis, to which it is here attached by means of the ſynovial membrane which lines the ſheath. Quitting the ſheath, it runs along the back of the hand, on the radial ſide of the tendon, which the fore-finger receives from the extenſor communis: theſe two approach each other, and are united at the articulation of the finger to the metacarpus. The common tendon paſſes over the back of the firſt joint of the fore-finger, over the firſt phalanx, and then divides into three portions, which terminate like thoſe of the extenſor digitorum communis: it correſponds to them alſo in every other particular. See **EXTENSOR**.

The poſterior ſurface of this muſcle is covered by the extenſor carpi ulnaris, the extenſor proprius auricularis, and extenſor communis digitorum, and by the integuments. Its anterior ſurface is in contact with the ulna, interoſſeous ligament, radius, carpus, interoſſeous muſcle of the ſecond interval, metacarpus, ſynovial membranes of the digital articulations, and the phalanges. The radial edge is in contact for a conſiderable ſpace with the extenſor tertii internodii pollicis; the ulnar edge is attached to a ridge of the ulna. It will extend the three phalanges of the fore-finger, and move it towards the ulnar edge of the hand, as in pointing to an object. It will extend the wiſt, and aſſiſt in the ſupination of the radius.

INDICAVIT, in *Law*, a writ or prohibition that lies for a patron of a church, whoſe clerk is ſued in the ſpiritual court by another clerk for tithes, which do amount to a fourth part of the profits of the advowſon; then the ſuit belongs to the king's court, by the ſtat. Weſt. 2. cap. 5. And the patron of the defendant being likely to be prejudiced in his church and advowſon, if the plaintiff recovers in the ſpiritual court, hath this means to remove it to the king's court. Reg. Orig. 35. Old Nat. Br. 31.

INDICIS-EXTENSOR, in *Anatomy*. See **INDICATOR**.
Semi-interoſſeus. See **ABDUCTOR**.

INDICTION, ſignifies the convoking of an eccleſiaſtical aſſembly; as a ſynod, or council, or even a diet.

INDICTION is applied to the ſeveral ſeſſions of the ſame councils.

Hence it is, that at the end of the ſeſſions of the council of Trent, the decree by which the council appoints the day of the future ſeſſion, is called the *indiction* of that ſeſſion.

INDICTION, in *Chronology*, a term uſed for a kind of epocha, or manner of counting time among the Romans; containing a cycle or revolution of fifteen years, which, when expired, begins anew, and goes round again without intermiſſion.

This method of computation has no dependence on the heavenly motions. Petavius ſays, there is nothing in chronology leſs known than the Roman indiction; he means, than its original and commencement. It is the general opinion, that it was inſtituted in the time of Conſtantine, about the year 312; but this is a mere gueſs. There were indictions in the time of the emperor Conſtantius, as appears from the Theodoſian Code. The learned hold, that indictions were originally no other than certain annual taxes, the tariffs whereof were publiſhed every year; but why they were ſo called, why confined to a cycle of fifteen years, when, and on what occaſion, inſtituted, is not known.

We find three kinds of indictions mentioned in authors; the indiction of Conſtantinople, beginning on the firſt of September; the Imperial, or Caſarean indiction, on the fourteenth of September; and the Roman or Papal indiction, which is that uſed in the pope's bulls, and which begins on the firſt of January.

The popes have dated their acts by the year of the indiction, which was fixed to the firſt of January, A. D. 313, ever ſince Charlemagne made them ſovereign; before which time they dated them by the years of the emperors.

At the time of the reformation of the calendar, the year 1582 was reckoned the tenth year of the indiction; ſo that beginning to reckon hence, and dividing the number of years elapſed between that time and this by 15, the remainder, with the addition of 10, will be the year of indiction, correſponding to the year of our Lord 1811. The indiction may alſo be found by adding 3 to the year of our Lord, and dividing the ſum by 15, the remainder is then the year of the indiction: if there be no remainder the indiction is 15. In either of theſe ways the year of indiction for 1811 is 14.

The word indiction comes from *indictio*, which ſignifies *eſtabliſhment*, *order*, or *denunciation*. The time of the indiction, among the Romans, was, that wherein the people were ſummoned to pay a certain tribute; and it is for this reaſon, that the imperial indiction began towards the end of September; becauſe the harveſt being then got in, it was ſuppoſed the people could more eaſily pay their tax.

INDICTIVE, **INDICTIVUS**, an epithet given to certain feaſt-days appointed by the Roman magiſtrates, *viz.* the conſul, or prætor.

INDICTMENT, derived from the French *indictier*, *indicare*, or, according to M. Lambard, from *indicare*, *I charge*, *I inform againſt*, in *Law*, a bill or declaration, of complaint, drawn up in form of law, for the benefit of the commonwealth: exhibited as an accusation of one for ſome offence, criminal or penal, and preferred to a grand jury, and by their verdict found to be true, and preſented before a judge or officer, who has power to puniſh or certify the ſame offence.

INDICTMENT, in *Common Law*, ſignifies as much as *accuſatio* among the civilians; though in ſome points it differs. See **ACCUSATION**.

Lambard ſays, an indictment is an accusation at the ſuit of the king, by the oaths of twelve men of the ſame county where the offence was committed; returned to inquire of all offences in general in the county, determinable by the court into which they are returned, and their finding a bill brought

INDICTMENT.

brought before them to be true. But when such accusation is found by a grand jury, without any bill brought before them, and afterward reduced to a formed indictment, it is called a presentment; and when it is found by jurors returned to enquire of that particular offence only, which is indicted, it is properly called an inquisition.

Although a bill of indictment may be preferred to a grand jury upon oath, they are not bound to find the bill, if they find cause to the contrary; and though a bill of indictment be brought to them without oath made, they may find the bill if they see cause. But it is not usual to prefer a bill unto them before oath be first made in court, that the evidence they are to give unto the grand inquest to prove the bill is true.

The grand jury (*sec JURY*) are to find the whole of a bill, or to reject it; and not to find it specially in part, &c. If they are satisfied of the truth of the accusation, they then indorse upon the bill of indictment "a true bill," anciently *billa vera*. But to find a bill, there must at least twelve of the jury agree. The indictment, when so found, is publicly delivered into court.

As indictments are purely for the good and quiet of the commonwealth, they are to be preferred for criminal, not civil matters. They are used in cases of high treason, and petit treason, felony, and trespasses of all kinds, and in all pleas of the crown; though they cannot be used for injuries of a private nature, that neither concern the king nor the public; and therefore all indictments ought to be brought for offences committed against the common law, or against statutes; and not for every slight misdemeanor. A person cannot be indicted of suspicion of felony, but of the very crime itself; and then if he be not in custody, the sheriff is commanded to attach his body by a *capias*, &c. A person indicted for felony may have counsel allowed to speak for him, as to matter of law only; but such as are indicted for treason may have a copy of their indictment before trial, in order to advise with counsel; and such indictments are to be found within three years after the offence committed, unless the treason be directly against the king's person. (7 and 8 W. III. cap. 3. which is extended to trials on impeachments by 28 Geo. II. cap. 30.) Persons indicted of treason must be by the oaths of two witnesses; but in other cases one witness is sufficient. The prisoner, in this case, shall also have a copy of the indictment, but not the names of the witnesses, five days at least before the trial, *i. e.* upon the true construction of the act 7 W. III. cap. 3. before his arraignment; he shall also have a copy of the panel of jurors two days before his trial; and he shall have the same compulsiue process to bring in his witnesses for him, as was usual to compel their appearance against him. By 7 Ann. cap. 21. every person indicted for high treason, or misprision of treason, shall not only have a copy of the indictment, but a list of all the witnesses to be produced, and of the jurors impanelled, with their professions and places of abode, delivered to him ten days before the trial, and in the presence of two witnesses. But this last act, so far as it affected indictments for the inferior species of high treason, respecting the coin and royal seals, is repealed by the statute 6 Geo. III. cap. 53. But no person indicted for felony is, or (as the law stands) can be, entitled to such copies, before the time of his trial.

Indictments must be certain in every point, and charge some particular offence; also goods stolen must be particularly set down, and the offence laid positively, and not by way of recital. There must also be expressed the Christian name, surname, and addition of the offender, with the day, year, and place in which the offence was committed, as also

the nature of the offence. (1 Hen. V. cap. 5.) In an indictment for murder, the length, depth, or other dimensions of the wound, must be expressed, that a judgment may be formed whether it was mortal; and in this case, the time of the death must be laid within a year and a day after the mortal stroke was given. (See *APPEAL*.) And in felony, the value of the things stolen is to be particularly mentioned, in order that it may appear whether the offender has been guilty of grand or petit larceny. A mistake in spelling the defendant's surname is not a sufficient cause for abating the indictment, provided it sounds like it. If a word of consequence be omitted in an indictment, it renders the whole naught; but the case is not the same where a word of form is omitted, or where there is an omission of a synonymous word, if the sense is not injured. In some crimes particular words of art must be used, which are so appropriated by the law to express the precise idea which it entertains of the offence, that no other words, however synonymous they may seem, are capable of doing it. Thus, in treason, the facts must be laid to be done "treasonably, and against his allegiance;" anciently, *proditorie et contra ligantia sue debiti*; else the indictment is void. In indictments for murder, it is necessary to say that the party indicted "murdered," not "killed" or "slew" the other; which, till the late statute, was expressed in Latin by the word "*murdravit*." In all indictments for felonies, the adverb "feloniously, *felonice*," must be used; and for burglaries also "*burglariter*," or in English, "burglariously;" and all these to ascertain the intent. In rapes the word "*rapuit*," or "ravished," is necessary, and must not be expressed by any periphrasis; in order to render the crime certain. So also in larcinies, the words "*felonice cepit et asportavit*," "feloniously took and carried away," are necessary to every indictment; for these only can express the very offence. In case one part of an indictment is inconsistent with another part of it, the indictment becomes void; though where the sense is plain, the court will dispense with a small inconsistency. Indictments are amendable the same term they are brought into court, but not afterwards; and in criminal prosecutions, the amendment must be only such as is permitted by the common law. Indictments for crimes committed, ought to be laid in the county where they were done; for otherwise, upon pleading the general issue not guilty, if it appears that the offence was committed in another county or place different from that in the indictment, the defendant will be acquitted. Yet if larceny be committed in any one county, and the goods carried into another, the offender may be indicted in either for the offence is complete in both. (1 Hal. P.C. 507.) Or, he may be indicted in England for larceny in Scotland, and carrying the goods with him into England, or *vice versa*; or for receiving in one part of the united kingdoms goods that have been stolen in another. (Stat. Geo. III. c. 31.) But for robbery, burglary, and the like, he can only be indicted where the fact was actually committed; for though the carrying away and keeping of the goods is a continuation of the original taking, and is therefore larceny in the second county, yet it is not a robbery or burglary in that jurisdiction. And if a person be indicted in one county for larceny of goods originally taken in another, and be thereof convicted or stands mute, he shall not be admitted to his clergy; provided the original taking be attended with such circumstances, as would have ousted him of his clergy by virtue of any statute made previous to the year 1691. (Stat. 25 Hen. VIII. 3 W. and M. c. 9.)

An offender is subject to indictment for a felony committed against a person unknown; yet somebody must be proved to be the proprietor upon the trial, or else the property will

will be presumed to be in the prisoner, he having pleaded not guilty. An indictment being at the king's suit, the prosecutor is a good witness to prove the charge contained in it; and no damage can be given to the party aggrieved, except it be particularly grounded on some statute. Indictments before justices of the peace may be removed by certiorari into the king's bench.

A bill of indictment is said to be an accusation, because the jury, who inquire of the offence, do not receive it till the party that offered the bill, appearing, subscribes his name, and offers his oath for the truth of it.

It is always at the suit of the king, and differs from an accusation in this, that the preferrer is no way tied to the proof thereof upon any penalty if it be not proved, except there appears a conspiracy. But if any one prefer an indictment to the grand jury for any criminal offence, without probable cause, and the bill is not found, or the party is acquitted, action lies for a malicious prosecution. In order to which it is necessary that the plaintiff should obtain a copy of the record of his indictment and acquittal; but in prosecutions for felony, it is usual to deny a copy of the indictment, where there is any the least probable cause to found such prosecution upon. But an action for a malicious prosecution may be founded on such an indictment whereon no acquittal can be; as if it be rejected by the grand jury, or be *coram non iudice*, or be insufficiently drawn.

INDICTMENTS, *Demurrer to*. See DEMURRER.

INDICTOR, in *Law*, he that indicteth another for an offence: and *indictée* is the party who is indicted. 1 Ed. III. cap. 11. 21 Jac. I. cap. 8.

INDICUM. In the writings of the ancients we find this word very frequently used, as the name of a blue colour, or pigment used in dyeing, and imported to Rome, Greece, and other parts of the world, from the East Indies. The greater number of writers make this the same with our indigo, or anil fecula; and some say it was the same with our woad; but the former opinion seems most probable.

This substance, which the Greeks call indicum, the Arabian writers, Avicenna, Serapion, and others, have called *nil*; though the same word is also sometimes used by them for the pigment made from woad. See INDIGO-FERA.

INDICUM *Folium*. See FOLIUM and TAMALAPATRA.

INDICUS CALMUS, in *Natural History*, is a fossil coralline body, supposed formerly to represent some species of reed, beset with stars on the surface.

INDICUS *Cocculus*. See COCCULUS.

INDICUS *Color*, a term used by several of the ancient writers to express black. The generality of the Greek and Roman physicians of old times have called the black lignum aloes, *agallochum indicum*; and the only black kind of myrobalan they were acquainted with, was in the same manner called the indicum; not that these were supposed peculiarly the product of the Indies, in distinction from the paler lignum aloes, or the other myrobalan; but that they were of that colour which they called indicus color.

INDICUS *costus*. See COSTUS.

INDIES, *East*, in *Geography*, comprehends that vast tract of country, which is situated in the south of Tartary, between Persia and China, as well as the islands in the East Indian sea, such as Borneo, Sumatra, Ceylon, Java, the Maldives, Celebes, Moluccas, Philippines, &c. See INDIA and HINDOOSTAN, and each island separately.

INDIES, *West*, includes islands of the Atlantic, which extend from the west of Florida, in a curve, to the coast of Surinam, in South America, from W. long. 58° 20' to

85° 30', and from N. lat. 10° to 27° 50'; Cuba being made the westerly boundary, and the Bahamas the most northerly; and fixing the easterly point at the island of Barbadoes, and the southerly at Trinidad. The name was given by Columbus, and has not been unfrequently applied to the whole of America. See each island separately described.

INDIGENOUS, of *indigena*, denotes a native of a country; or that which was originally born or produced in the country where it is found. In this sense, particular species of animals and plants are said to be indigenous in the country where they are native, in opposition to exotic.

INDIGESTION, in *Medicine*, in the acceptation in which we employ the term, implies not only the imperfect performance of the act of digestion, but also an impaired condition of the functions of the stomach and chylopoetic viscera in general.

In using the term *indigestion* in this extensive sense, we follow the example of Dr. Cullen, who has comprehended, under the head of *Dyspepsia* (from *dys*, ill, and *πεπτεω*, to digest), a great variety of symptoms, which other nosologists have considered as distinct diseases, and described under various appellations, but which, he is of opinion, are all referrible to one common cause, an imbecility, or loss of tone in the stomach. (See Cullen, *Nosol. Method. Gen.* xlv. and First Lines, § 1190, and 1193). Among the symptoms just alluded to, which stand as distinct genera in other nosological systems, are *Anorexia*, or *loss of appetite*; *Cardialgia*, or *heart-burn*; *Gastrodynia*, or *stomach colic*; *Flatulentia*, or *flatulence*; *Nausea*; *Vomitus*, *Soda*, &c. (See the *Nosol. Systems of Sauvages, Vogel, and Linnæus*.) To the same disordered condition of the digestive organs, when it is sympathetic of, or combined with other complaints, Dr. Cullen likewise referred many of those undefined affections, which have been confusedly classed together under the general title of *nervous diseases*, or under that of *chronic weakness*. From the great importance of the stomach in the animal economy, in which it is, as it were, the laboratory of health, and from its sympathetic relation to every other important organ in the body, it is obvious that every derangement to which it is exposed must occasion some corresponding derangement in other parts of the system, and that it must suffer, in its turn, whenever any distant organ is much indisposed; and hence, that indigestion will most frequently be accompanied with various adventitious symptoms, and that it will be of two kinds, idiopathic and sympathetic, according as the stomach itself, or some other organ, is the seat of the primary disorder. It is of the idiopathic indigestion, however, that we particularly treat at present.

The symptoms which characterize idiopathic *dyspepsia*, are an irregular, but commonly deficient appetite, with occasional squeamishness, sometimes actual vomiting;—a sense of load and distention of the stomach after meals, followed by eructations of air, or of solid or fluid matter, of various qualities, acid, pungent, nidorous, or insipid;—heartburn, and pains in the region of the stomach. Some or all of these symptoms occur at different times or in different individuals, and are commonly combined with irregularity of the bowels, which are most frequently costive, but sometimes lax, or in each of these states by turns. The mouth and throat are usually dry, especially in the morning, and the tongue is at the same time furred, and of a white or yellow colour, and there is a disagreeable taste on the palate.

These are the direct indications of a deranged condition of the stomach itself, and the consequent irritation of indigested aliment. The sense of load is occasioned by the remora

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remora of the food in its undigested state, and that of distention by the evolution of air, which is probably occasioned by the spontaneous decomposition or fermentation of the alimentary matter, and is relieved by eructation and the discharge of flatus. The irritation of the acid or acrid crudities upon the coats of the stomach, especially about the upper orifice, excites the sensation of heart-burn, and occasional spasmodic and inverted actions of the stomach and gullet, by which eructations are produced, as well as spasmodic contraction of the muscular parts of the stomach, which is accompanied by pain or gastralgia: over-dilatation of the coats of the stomach, by the flatus, is likewise productive of pain.

But in addition to these morbid sensations and phenomena in the stomach itself, an infinite variety of symptoms occur, in different instances, indicating the sympathetic affection of the constitution at large, or of particular organs. These have commonly been called *nervous* symptoms, inasmuch as they have originated merely from a sympathy of parts, independently of any disordered state of the circulation, or of any morbid change in the structure of the suffering organs; and they are often more distressing than the primary symptoms belonging to the affection of the stomach. Among the symptoms to which we allude, are languor, sluggishness, and indisposition to exertion, either mental or corporeal, but especially the latter; drowsiness, particularly after meals or slight exercise; giddiness, noise in the ears, occasional dimness of sight, or a sense of objects floating before the eyes, with head-ache under various forms, most frequently affecting the forehead and temples, sometimes the crown and the occiput; severe flying pains; palpitations of the heart, or intermissions in its pulsation, with considerable variations in the state of the pulse; total restlessness, or unrefreshing sleep during the night, with frightful dreams, the *incubus*, or night-mare, &c.; temporary absence of mind, impaired memory, unusual timidity and despondency; and, in short, all the train of complaints which belong to *hypochondriasis* and *hysteria* in the constitutions in which they are liable respectively to occur. See these articles.

The experiments of modern physiologists have shewn that the process of digestion is principally effected by means of the fluids of the stomach, which possess a solvent power over the substances used as aliment; and that it is not a process of concoction, putrefaction, attrition, or fermentation, as was anciently supposed. (See *DIGESTION*.) It would seem, therefore, that the essential cause of idiopathic dyspepsia consists in a change in the quantity or quality of this gastric fluid, or solvent, originating from an impaired condition of the secretory function of the stomach. This, however, can perhaps only be ascribed to the deficiency of its tone and vigour as a muscular organ. Dr. Cullen justly remarks, that, as the peculiar nature of the digestive fluid, the changes which it may undergo, and the causes by which it may be changed, are very little known to us, we cannot found a practical doctrine upon any supposition respecting it; but as, at the same time, the imbecility of the stomach, either as the cause or the effect of the change in the digestive fluid, seems always to be present, and to have a great share in occasioning the symptoms of indigestion, we may still consider the imbecility of the stomach as the proximate and almost sole cause of *dyspepsia*. He observes, too, that this view of the subject is the more admissible, as it appears to be fully and clearly applicable to the explanation of the practice which experience has established as the most successful in this disease. First Lines, § 1196.

Causes of Indigestion.—Certain original constitution of the

body is obviously connected with a predisposition to this complaint: this is sometimes manifest only in a defective performance of the functions of the stomach itself; but in other cases it is evidently a part of the general want of tone and vigour in the body, and occurs in persons of lax fibre, and sanguine or sanguineo-phlegmatic temperament. In persons of dark and sallow complexion, the stomach itself appears to be often originally weak, in a degree disproportionate to the general condition of the habit.

The *exciting causes* of indigestion, then, must be looked for among those circumstances which tend either to produce a loss of tone in the muscular fibres of the stomach, or which, in the debilitated state of that organ, tend to oppress its powers and to impede its functions. The causes which contribute to impair the vigour of the stomach are of two kinds; namely, those which operate directly upon that organ, and those which affect it indirectly, or through the medium of the general system.

The vigour of the stomach is impaired by the excessive use of stimulating condiments, and of spirituous liquors, as well as by the abuse of certain articles of the sedative or narcotic kind, such as tobacco, tea, coffee, opium, bitters; and by the too frequent and copious use of acid and ascetic articles of food, and of warm watery liquids. Frequent vomiting, whether arising spontaneously or excited by art, tends also greatly to debilitate the stomach; and over-distention of the organ by an excessive quantity of food or drink, or the use of food in itself difficult of digestion, or difficult from the idiosyncrasy of the individual, equally contribute to the same effect. The want of due mastication, and of the proper commixture of the saliva with the food, by which its tendency to putrefactive decomposition may be diminished, likewise materially enfeebles the digestive powers of the stomach, and adds to the oppression where it is already weakened. Whence the habit of frequent spitting, or rejection of the saliva, is justly enumerated among the causes of indigestion. Compression of the stomach after a full meal, as by particular postures, &c., or violent exercise or succussion of the body, under the same circumstances, have been found to have a material influence in preventing the process of digestion, and oppressing the powers of the stomach. Hence various occupations and trades, in which compression and succussion of the distended stomach are daily produced, occasion habitual *dyspepsia* in those who are predisposed to the disease.

Many of these occupations, however, debilitate the stomach likewise through the medium of the general system, or by deranging other organs and functions with which the stomach particularly sympathizes. The sedentary and inactive life, connected with many of them, debilitates the body in all its functions, and the stomach most particularly; intense study, or close application of mind to any business, when long continued; grief, anxiety, vexation of mind, and disorderly passions of any kind; venus immodica; exposure to moist and cold air, when without exercise; and frequent intoxication, which belongs partly to this head, and partly to the former,—are all common remote causes of that imbecility of stomach which is connected with indigestion. Dr. Cullen remarks, that, though the disease, as proceeding from the last set of causes, may be considered as a symptomatic affection only; yet as the disorder of the stomach is generally the first, always the chief, and often the only effect which these causes produce or discover; so the affection of the stomach may be considered as the disease chiefly to be attended to in practice; and the more properly so, as in many cases the general debility is only to

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be cured by restoring the tone of the stomach, and by remedies first applied to this organ.

On the other hand, however, it is not to be omitted, that the stomach, from its extensive sympathy, by which it is often a partaker of morbid irritation seated in other organs, occasionally displays symptoms of derangement so violent, and apparently so confined to itself, as to make the primary and proper source of the derangement be altogether overlooked. Many instances might be quoted of the successful treatment of seemingly idiopathic dyspepsia, by remedies which manifestly and chiefly operate upon other organs, and exert little or no immediate beneficial influence on the stomach. The viscera, more immediately concerned in the function of digestion, especially the liver, and the alimentary canal, are often the seat of the original irritation in such cases; the kidneys and the uterus occasionally produce similar effects.

Treatment of Indigestion.—In attempting to cure this state of the stomach, we may consider the following indications as the principal points to be pursued: *first*, to avoid, or remove, or, as far as may be, to regulate those things which have been enumerated above as the ordinary exciting causes of the disease; *secondly*, to palliate or remove those urgent symptoms, which especially contribute to aggravate and continue the disease; and *thirdly*, to restore the tone and vigour of the stomach, and of the system at large.

The propriety and necessity of the first indication is sufficiently evident, as the continued application, or frequent repetition of those causes, must necessarily tend to continue the disease, to defeat the efficacy of remedies, or to occasion the recurrence of the disorder in spite of the operation of these. Dr. Cullen justly remarks, that it is commonly owing to the neglect of this indication, that this disease is so frequently obdurate in its duration. It would be superfluous to enumerate the various modes of fulfilling this indication, which will be sufficiently obvious from the consideration of the several causes: but this circumstance evinces the importance of minutely investigating the origin of the disorder, previous to the administration of remedies, and of ascertaining whether the dyspepsia be constitutional or acquired, whether idiopathic or symptomatic, whether owing to any organic derangement of the stomach, such as tumour, ulcer, or scirrhoty, or whether arising merely from errors in diet, or other extrinsic agents. It must be observed, however, that the accomplishment of this first indication is often exceedingly difficult: for, in many cases, the circumstances of the patient will not admit of any material change; his avocations themselves, upon which his subsistence depends, comprehend, perhaps, the principal cause of the mischief. More frequently, the obstacles arise from the difficulty of inducing men to break in upon established habits, or to renounce the pursuit of pleasure; and especially, to persuade them that those practices, which they have often repeated, and seen others repeat, with seeming impunity, are in reality prejudicial.

Some allowance, indeed, is necessary to be made for the influence of habit, in all changes that relate to the animal economy, and especially where these habits have been carried to the extreme. For if the stomach have been long accustomed to excessive stimuli, whether from condiments or spirituous liquors, the total abstraction of these from the diet might occasion a direct debility, under which the powers of life might sink. Under such circumstances, therefore, some degree of the accustomed stimulus must be for some time indulged in, or some less prejudicial one substituted. But the apprehensions of danger, from great changes in the habits of life, which are generally entertained, are carried to an

extent which experience does not justify. Almost all the general rules which can be laid down, in respect to the wholesomeness of certain articles of diet, admit of exceptions from peculiarities of constitution in particular individuals. Some indications on this point, however, may be obtained by attending to the obvious prevailing state of the stomach, as evinced by the acid or nidorous eructations, &c. The acid state of the stomach implies the necessity of diminishing the proportion of vegetable food; while the nidorous condition may be benefited by augmenting that part of the diet, and lessening the quantity of animal food. It is of much importance that the whole quantity of food should be such as not to overload the stomach, or occasion considerable distention. There is a common precept, under which great errors are sometimes committed, in the way of overloading the stomach, or at least of exhausting its digestive powers, namely, that of eating little and often, so that long fasting may be avoided on the one hand, and too much repletion on the other. With the view of fulfilling this precept, an almost incessant supply of aliment is sometimes thrown into the stomach; so that the digestion of one portion is never completed, before another is combined with it in a crude state, thus aggravating the crudities which the disease itself produces, or preventing their more effectual assimilation.

In fulfilling the *second* indication, of removing urgent symptoms, one of the first objects pursued by some practitioners, is that of removing the crudities of the stomach produced by the disease, by means of emetics: Dr. Cullen himself appears to be the advocate of this practice. (First Lines, par. 1204.) Nevertheless, as these crudities are commonly the effect of the disease, and not the cause, the expulsion of them from the stomach by vomiting can afford but a brief and temporary relief; and the same uneasiness will recur after the first or second meal. And, moreover, experience has shewn us, that frequent vomiting, however excited, tends to weaken the stomach, to diminish its powers of digestion, and to render it less able to retain what is thrown into it, and therefore ultimately to aggravate the symptoms which it was intended to relieve. "They are unhappy," says the same physician in another place, "who trust to this mode of relief, and have frequent recourse to it; for I am certain, from much experience, that frequent vomiting hurts the tone of the stomach, and often makes the symptoms of digestion recur more frequently and sooner than they otherwise would have done." (Cullen on Mater. Medica, vol. ii. p. 465. See also Emetics.) We have stated under that article, the circumstances which have led to the erroneous supposition, that the indigestion and its concomitant symptoms originate in the presence of bile and other extraneous fluids in the stomach; and explained how the discharge of bilious and mucous matters from the stomach, under the operation of an emetic, may be the effect of the vomiting, although they might not previously have been lodged there. In short, there are few instances of *dyspepsia* in which the use of emetics can be deemed beneficial.

Of the other urgent symptoms, which require to be palliated, the principal are *acidity*, and its frequent concomitant, *heart-burn*,—pain in the stomach,—the ejection of a copious and clear fluid, or *water-brash* (as it is termed in Scotland),—and *constipation* of the bowels. It will not be necessary for us to dilate upon the method of treating these symptoms here, since they will be found amply discussed under their proper heads; as they are often so peculiarly distressing to the patients, as to be considered themselves the principal diseases, and to be the principal subject of complaint. We may briefly observe, that the presence of acid in the stomach

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in a morbid degree is known, not only by its rising occasionally into the mouth and throat by eructation, and by the heart-burn which accompanies it (see *CARDIALGIA*); but also by the occurrence of gnawing pains in the stomach, flatulency, irregular cravings for food, griping and looseness of the bowels, &c. The acidity already present in the stomach may be corrected, by neutralizing it by means of a chemical combination with some alkali or absorbent earth. The three alkalis, soda, potash, and ammonia, may be taken for this purpose respectively, either in the pure (or caustic) state, or mild, *i. e.* in the form of carbonates: on the whole, they seem to be more efficacious in the pure state. The soda-water, now manufactured in the shops, is an agreeable form of antacid; but the alkali may be taken with advantage in larger quantities than that beverage contains. Magnesia, chalk, and the testaceous powders prepared from crabs-claws and oyster-shells, which are carbonates of lime, likewise combine with the gastric acid, and neutralize it: the magnesia (which is much more effectual in its pure state, or calcined, than in the form of carbonate) is often useful, inasmuch as it forms a neutral salt, which is in some degree laxative, with the acid of the stomach. It is not, however, sufficient to neutralize the present acidity, the disposition to generate it must be also obviated. This is to be effected partly by avoiding acedent aliments of the vegetable class, and using animal food, such as is little capable of acescency. But as vegetable food cannot be entirely discarded, the excess of its acescency may be in some measure avoided, by chusing such vegetable matters as are the least disposed to the vinous fermentation, such as leavened bread, and well fermented liquors; and instead of using the fresh native acids, employing vinegar. But the disposition to acidity may be farther prevented by other means; namely, by those which invigorate the muscular fibres of the stomach, to be mentioned presently. It appears that the acidity occurs in a morbid quantity, either from a change in the digestive fluids, becoming less fit to moderate the natural progress to fermentation, or from their not being supplied in sufficient quantity; both of which probably arise from a weakened action of the stomach. For it is observed, in some instances, that sedative or depressing passions immediately occasion the appearance of acidity in the stomach, which did not appear before; and also that the use of stimulants, applied to the stomach, often corrects or obviates an acidity, that would otherwise have appeared.

Of that symptom of the dyspeptic state of the stomach, which is a common concomitant of indigestion, *pain*, or *stomach-colic*, *gastrodynia*, we have already treated at length. (See the last term.) Having there stated the various circumstances under which it occurs, and especially in the two opposite states of repletion and inanition, as well as the method of cure, which succeed in these two conditions respectively, we deem it unnecessary to repeat the observations here.

In fulfilling the second indication, another symptom which requires particularly to be obviated is *costiveness*. There is so much connection between the several portions of the alimentary canal with respect to the peristaltic motion, that if accelerated or retarded in any one part, the other parts of it are commonly affected in the same manner. Thus as the brisker action of the stomach must accelerate the action of the intestines, so the slower action of the intestines must in some measure retard that of the stomach. It is therefore of consequence to the proper action of the stomach, that the peristaltic motion of the intestines, determining their contents downwards, be regularly continued, and that all costiveness, or interruption of that determination, be avoided. But an indiscriminate use of cathartic medicines is much to be deprecated. For it must be observed, that, as every considerable evacuation

of the intestines weakens their action, and tends therefore to induce costiveness when the evacuation is over; so those purgatives which produce a large evacuation are unfit for correcting the habit of costiveness. The milder cathartics, therefore, are the most suitable for this purpose, which do no more than solicit the intestines to a more ready discharge of their present contents, without either hurrying their action, or increasing the excretions into their cavity; either of which might produce a purging. Dr. Cullen was of opinion, that medicines which particularly stimulate the large intestines, and act little on the higher parts of the intestinal canal, were peculiarly proper for this purpose, such as the aloetic, and other resinous purgatives. These medicines certainly produce a very beneficial operation in numerous instances, probably by supplying the place, as it were, of the bile, which appears to be the natural tonic and laxative to the intestines, and which is often both deficient in quantity, and depraved in quality, in dyspeptic habits. The augmentation and correction of this fluid is often an important object in the treatment of indigestion, and the changes in the appearance, odour, and consistence of the stools, as well as the presence or absence of griping, tenesmus, heat and irritation in the seat, &c., are among the principal diagnostic symptoms in regard to the condition of the bile, which seems to be the chief cause of the variations of the alvine discharge. (See Abernethy's *Observations on the Dis. of the Health*, &c.) For the purposes of augmenting and correcting the biliary secretion, the milder preparations of mercury, which require to be varied according to circumstances, which have not yet been accurately described, appear to be the most effectual agents. It is probable that the long expected treatise of Dr. James Curry will contribute materially to elucidate this important subject; and we trust that we shall be able to avail ourselves of the assistance of that work, before we compose our article on the *chronic diseases of the LIVER*.

The peculiar modification of dyspepsia, called by the Scotch *water-brash*, the *Cardialgia sputatoria* of Linnæus, (Gen. Morborum, Class iv. Ord. 1.) and the *Pyrosis* of Cullen, (for which we have no appropriate English name,) is a sufficiently distinct disease to be discussed in a separate article. See *PYROSIS*. See also *FLATULENCE*, *NAUSEA*, and *VOMITING*.

The *third* indication, which is properly the curative one, is to restore the tone and vigour of the stomach, the loss of which is deemed the principal source of the disease. The means of accomplishing this indication may be referred to two heads; one of which includes those means which operate directly and chiefly on the stomach itself; and the other, those which, operating upon the whole system, communicate their tonic powers secondarily to the stomach.

The medicines which operate directly on the stomach, comprise all those articles which are denominated *tonics*, and many of those called *stimulants*, and *astringents*.—The bitter vegetable substances, or *bitters*, as they are emphatically called, and especially those which combine some aromatic quality with their bitterness, are most frequently prescribed for this purpose, and possess very considerable efficacy. Such are the roots of gentian, colomaba, and rhubarb; the bark of cinchona, cascarilla, &c.; the quassia wood; the flowers of chamomile; and many other vegetable productions. Experience, however, seems to have decided, that these bitters cannot be taken for a great length of time with impunity. Some have imagined that there is a certain quantity of a narcotic power resident in them, which, though insensible in its effects for a considerable time, ultimately occasions a deleterious influence on the constitution. This was particularly learned from the consequences of a long-continued use of the

celebrated Portland Powder, for the cure of the gout : a very large number of those persons who took that medicine, which consisted of bitters and aromatics, having died of apoplexy, or some other severe disease, after having been apparently much benefited by its use. When these medicines are taken, therefore, with a view to restore the tone and vigour of the stomach, it is advisable not to employ them unremittingly for a great length of time ; but to suspend the use of them occasionally for a considerable period, substituting some other corroborant medicines, if necessity require them. Among these the *mineral acids* are important adjuvants, especially the sulphuric (or vitriolic) and muriatic acids ; which have not only a direct tonic power upon the stomach, increase the appetite, and aid digestion, but also tend to prevent the process of fermentation in the food taken in. In this way, probably, their efficacy in preventing the formation of acidity in the stomach, and the heart-burn, &c. arising from such acidity, is to be explained. It is certain, that, in many instances, where the alkalies and absorbents have failed to obviate acidity and its consequences, connected with indigestion, the free use of one or other of the mineral acids has effectually remedied the disorder. *Aromatic* substances stimulate the stomach, and frequently therefore relieve aciescency, flatulence, and cardialgia ; *e. g.* cinnamon, ginger, capicum, &c. but their stimulus is transitory, and if they are frequently repeated, and taken in large quantities, they may injure the tone of the stomach. *Chalybeate* medicines, or the various preparations of iron, are often employed as tonics, in the cure of indigestion ; and they may be administered in considerable quantities with safety. They have not, however, been found so efficacious in the cure of indigestion, as the remedies above-mentioned ; and they are principally taken in the form of *chalybeate waters*. But it is certain that these waters contain in general a very small proportion of steel ; and that other preparations of the steel are administered in much larger quantities without producing those salutary effects, which are often ascribed to the mineral waters ; it is, therefore, probable that the benefits, which are observed to accrue during the use of these waters, are generally the result of other circumstances connected with the drinking of them.

For, in fact, the most essential means of fulfilling the third indication are those which strengthen the system at large, and thus indirectly restore the vigour of the stomach ; and among these, *exercise* claims our first notice. We have shewn, in its proper place, the mode in which exercise operates, in promoting the full and perfect circulation of the fluids through all the organs of the body, and therefore in perfecting the performance of all the functions. (See EXERCISE.) But we may remark, with Dr. Cullen, that it in a particular manner strengthens the stomach by promoting perspiration, and exciting the action of the vessels on the surface of the body, the skin having a peculiar sympathy with the stomach. In this instance, however, as in every other operation of the animal economy, moderation must be the leading rule ; for, although the steady and free circulation through the cutaneous vessels conduces to a sympathetic support of the action of the stomach ; yet excessive perspiration, arising from over-action of these vessels, is followed by a languor and partial torpor, which is also communicated to the stomach ; inasmuch that sickness, and total loss of appetite are often the immediate results of violent exercise, attended with profuse perspiration. Regular exercise on horseback has been generally found the most effectual means of strengthening the stomach, and of curing indigestion.

Cold bathing is another important mode of restoring both general and local vigour ; but unless it be resorted to with

some discrimination, like other active agents upon the animal frame, it may be productive of much detriment. In order to obtain benefit from the external application of cold, a certain degree of vigour in the circulation, especially in the vessels of the skin, should be present. In the dyspeptic state, the temperature of the skin is liable to be defective, and the cutaneous circulation to be feeble ; and under such circumstances, so far from giving strength to the constitution, or to the stomach, the powers of life are depressed by the use of the cold bath, and the digestive organs sympathize in the torpor, produced in the skin. The tepid or warm bath is more beneficial when this condition of the system exists, and the baths of Buxton and Matlock may be resorted to with advantage ; the same principle, however, must be kept in view in the use of these ; which must not be entered with a chilly and shuddering surface ; nor the immersion be repeated, if a glow does not succeed. See COLD, as a remedy.

In consequence of the great sympathy between the stomach and the skin, the proper regulation of the *clothing* is a matter of considerable importance to those who are liable to indigestion ; and as the temperature, though variable, is most frequently below the standard of health, so in general warmth is a necessary quality to be maintained. This is most particularly required in the extremities, in which the circulation is necessarily most languid, in consequence of the greater distance from the heart ; warmth and dryness of the feet, therefore, are peculiarly serviceable in the cure and prevention of dyspepsia ; and for those whose temperature is easily diminished by external cold, the general stimulus and slow-conducting power of woollen garments, worn next the skin during the winter months, may be considered as affording much security from the attacks of indigestion. But as profuse perspiration is generally accompanied by some degree of sympathetic debility in the stomach, these garments should not be used, during the hot seasons, by those whose skin is readily brought into a perspirable state.

A relaxation of the mind from the anxieties of business and the fatigues of study, and the pursuit of objects of amusement, contribute materially to the well-being of the animal economy, and especially to the proper performance of the digestive functions. This object is more particularly to be considered, when there is a tendency to hypochondriasis. And as we have already observed, it is probably from the amusements and regular exercise, which are generally enjoyed at watering places, as they are called, that more benefits accrue to the dyspeptic invalids, than from the virtues of the mineral springs, these places of resort may be recommended.

Before we conclude this topic, it may be proper to state, that several contemporary physicians and surgeons have observed, that a disordered condition of the digestive organs, however induced, becomes the cause of many secondary diseases, both general and local ; such as superficial ulcerations, pains, tumours, &c. : which spontaneously cease, when the disorder of the digestive organs is removed. We may remark, however, that it is not every disorder of digestion which is followed by these consequences ; and that it is rather in the morbid condition of the *biliary* secretion, than of the stomach itself, that the disorder alluded to consists. Its symptoms are thus described by Mr. Abernethy. "This slighter disorder of the chylopoietic organs is, in general, manifested by a diminution of the appetite and digestion, flatulence, and an unnatural colour and sctor of the excretions, which are generally deficient in quantity. The tongue is dry, whitish, or furred, particularly at the back part : this symptom is most apparent in the morning. The fur is greatest at the back part, and extends along the middle of

the tongue to the tip, the edges remaining clean. As the disease advances, a tenderness is felt when the epigastric region is compressed, and the patient breathes more by the ribs, and less by the diaphragm, than in the healthy state. The urine is frequently turbid." (Abernethy on the Constitut. Origin of Local Dis.) In whichever of the organs concerned in digestion this morbid condition may be principally seated, the others participate, and various effects follow, in the manner thus described by Mr. Abernethy. "It is generally admitted, that disorders of the chylopoietic viscera will affect the source of sensation, and consequently the whole body; but the variety of diseases, which may result from this cause, has not been duly weighed and reflected on. It may produce, in the nervous system, a diminution of the functions of the brain, or a state of excitation, causing delirium; partial nervous inactivity and insensibility, or the opposite state of irritation and pain. It may produce, in the muscular system, weakness, tremors, and palsy; or the contrary affections of spasm and convulsions. It may excite fever, by disturbing the actions of the sanguiferous system; and cause various local diseases, by the nervous irritation which it produces, and by the weakness which is consequent on nervous disorder or imperfect chylification. Or if local diseases occur in a constitution deranged in the manner which I have described, they will become peculiar in their nature and progress, and difficult of cure. Affections of all those parts which have a continuity of surface with the stomach, as the throat, mouth, lips, skin, eyes, nose, and ears, may be originally caused or aggravated by this complaint." Whenever, therefore, local diseases are connected with this slight derangement of the digestive organs, the first care will be to correct this derangement, as the most important step towards the cure of the former. For while the secretion of bile is either defective, or depraved in quality, (of which the appearances of the alvine discharge afford the best index,) the local or general symptoms of disorder, connected with this condition of the hepatic function, will not yield to remedies that would otherwise seem to be appropriate, and readily effect a cure.

INDIGETES, a name which the ancients gave to some of their gods.

There are various opinions about the origin and signification of this word; some pretending it was given to all the gods in general; and others only to the semi-gods, or great men deified. Others say it was given to such gods as were originally of the country, or rather such as were the gods of the country that bore this name; and others again hold, it was ascribed to such gods as were patrons and protectors of particular cities.

Lastly, others hold indigetes to be derived from *inde genitus*, or *in loco degens*, or from *inde* and *ago*, for *dego*, *I live*, *I inhabit*; which last opinion seems the most probable.

In effect it appears, 1. That these indigetes were also called *local gods*, *dii locales*, or *topical gods*, which is the same thing. 2. The indigetes were ordinarily men deified, who indeed were, in effect, local gods, being esteemed the protectors of those places where they were deified; so that the second and third opinion are very consistent. 3. Virgil joins *patrii* with indigetes, as being the same thing, Georg. i. ver. 498. *Dii patrii*, indigetes. 4. The gods to whom the Romans gave the name indigetes were, Faunus, Vesta, Æneas, Romulus, all the gods of Italy; and at Athens, Minerva, says Servius; and at Carthage, Dido. It is true, we meet with Jupiter *indiges*; but that Jupiter *indiges* is Æneas, not the great Jupiter; as we may see in Livy, lib. i.

cap. iii. in which last sense Servius assures us, *indiges* comes from the Latin *in diis ago*, *I am among the gods*.

Among these indigetes gods, there is none more celebrated, nor more extensively worshipped, than Hercules.

INDIGHIRKA, in *Geography*, a river of Russia, which rises in nearly 64° N. lat., in the Stanovoi-Krebet, and being reinforced by the Amekou and a multitude of smaller rivers, falls, in four great arms, into the Frozen ocean, N. lat. 73° E. long 144° 14'.

INDIGNATORIUS, in *Anatomy*, a muscle thus called, as being supposed to draw the eye from its inner corner outwards, which gives an appearance of scorn and anger.

But this is properly a compound motion of two muscles; for which, see **EYE**.

This muscle is called by others the rectus exterior, and abducens; and by Albinus, the abductor. It is one of his *quatuor recti oculi*.

INDIGO, or **ANIL**, *Botany*. See **INDIGOFERA**.

From this plant is extracted a dyer's drug, of a deep blue colour, brought hither from the West Indies and America. It is also made in the East Indies, particularly in the dominions of the Great Mogul, the kingdom of Golconda, &c.

The ancients were acquainted with the dye, which we call indigo, under the name of "Indicum." Pliny knew that it was a preparation of a vegetable substance, though he was not justly informed concerning the plant itself, and the process by which it was fitted for use. From its colour, and the country from which it was imported, it is denominated by some authors "Atramentum Indicum" and "Indicum nigrum." Even at the close of the 16th century it was not known in England what plant produced indigo. Gerarde, in 1597, is wholly silent about it, and so is Johnson in 1632. Parkinson, however, in 1640, treats largely of it. He calls it "Indico or Indian woade," and gives a figure of the leaf from De Laet. He then describes it, first from Francis Ximenes in De Laet's description of America; and secondly, from Mr. William Finch, a London merchant, in Purchas's Pilgrims. Even in 1688 Mr. Ray says it was not agreed among botanists what plant it is from which indigo is made; but that the most probable opinion was, that it is a leguminose shrub, allied to Colutea. He describes it from Hernandez and Margraaf; and subjoins that of the "Ameri" from the Hortus Malabaricus. *Nil* or *Anil* is the American name. In Arabic it is *Nile*. The Portuguese have adopted their *Anil* or *Anileira* from the American. The other European nations generally call it *Indigo*. In Chinese it is *Tien laam*, which signifies sky-blue. Mr. Miller cultivated the dyer's indigo so long ago as the year 1731; and calls it Guatimala indigo, saying that with us it is an annual plant. Specimens of the *Indigofera tinctoria*, or dyer's indigo, from different parts of India, Madagascar, Java, Ceylon, &c. vary very much, if they are all really the same species. Linnæus says that it is almost an exotic in Ceylon, but frequent in Paliacotta and Coromandel. According to Lourciro it is spontaneous in China and Cochinchina, and is cultivated all over those vast empires. Dr. Patrick Browne, besides the wild indigo already mentioned, has two others, which he calls the indigo, and the Guatimala indigo; the former yielding more of the dye than either of the others, is generally preferred, though subject to many more mischances.

It has been generally believed, that the indigo plant flourishes only in the climate of the torrid zone, and in those parts of the temperate zone which are near the tropics. But experiments lately made in Italy by Bruley, by order of government,

government, have proved that, in a suitable soil and exposure, and with good seed, it may be cultivated in a southerly climate. Accordingly, he has obtained the indigo plant in the gardens of the Chateau de la Venerie, near Turin; and by submitting it to the process employed at St. Domingo, he has extracted an indigo which might bear comparison with the finest indigo of the colonies. His plantations were made towards the end of February. M. Icard de Bataligni, another colonist, cultivated the plant in 1805, in the department of Vaucluse, in France; and his results confirm the hopes formed with respect to the culture of indigo in Europe.

Labat has given a particular account of the culture of the plant, and the preparation of the indigo. The ground being thoroughly cleared from weeds (one of the principal points in the culture), and, we may add, drained, a number of slaves, ranged in a line, march across, making little trenches of the width of their hoes, and two or three inches deep, about a foot distance from one another every way: then, returning, they drop some seeds in each trench, and afterwards cover them with the earth taken out. The soil, it is observed by others, should be free and rich, and the climate warm: and the season of sowing should be rainy; as the earth must either already have imbibed water, or rain must speedily follow the sowing; otherwise the seed becomes heated, corrupts, and is lost, after all the labour it has occasioned. During the process of vegetation the ground must be carefully weeded, in order to prevent any mixture of herbs, which would injure the indigo in its manufacture. In moist weather, the plant comes up in three or four days; and in about two or three months after, it is fit for cutting: if suffered to stand till it runs into flower, the leaves become too dry and hard, and the indigo obtained from them proves less in quantity, and less beautiful: the due point of maturity is known, by the leaves beginning to grow less supple, or more brittle. In rainy seasons, the cutting may be repeated every six weeks: cutting in dry weather kills the plant, which, if that is avoided, continues to afford fresh crops for two years.

A large quantity of the herb is put into a vat or cistern of strong mason work, with so much water as is sufficient to cover it; and some wood laid above to prevent its rising up. The matter begins to ferment, sooner or later, according to the warmth of the weather, and the maturity of the plant, sometimes in six or eight hours, and sometimes not in less than twenty. The liquor grows hot, throws up a plentiful froth, thickens by degrees, and acquires a blue colour, inclining to violet. In proportion as the caloric increases, azote is disengaged, the herbaceous mucilage separates, the vegetable is decomposed, and the mixture absorbs oxygen. The fermenting fluid passes from a green to a violet tinge, and this by degrees changes to a blue colour. The great art of the manufacturer is to check the fermentation at a proper degree. If the fermentation is too feeble or too brief, the plant remains impregnated with much essential salt, which diminishes the quantity of indigo. If it be too long, the tender extremities of the plant undergo a putrefaction which destroys the colour. Some years ago, the following criterion was published at St. Domingo, for ascertaining invariably the correct fermentation of the indigo. It is only requisite to write on white paper with the matter to be examined. If this ink be of very high colour, it is a proof that the fermentation is not yet at its true point. The experiment is repeated every quarter of an hour, till it is perceived that the liquid has lost its colour. This was pronounced an infallible index to shew the true point of fermentation. Others, however,

judge of the proper stage of fermentation by means of a silver cup, into which they throw the liquid, shaking it till grains are formed; by their quality, and that of the fluid, they judge of the fermentation. When the feculent particles begin to precipitate to the bottom of the cup, it is then judged, that the herbs have attained the true degree of maceration for obtaining indigo. It has been observed, however, that this procedure often led into error; and, therefore, five or six minutes after the liquid has been put into the cup, it was perceived to form round its sides a cordon of fecula, or sediment, at first of a green colour, and then blue. When the maceration is not at the requisite point, this cordon, or girdle, detaches itself with difficulty from the sides of the cup, but finally precipitates, and concentrates at the bottom, always towards the centre, and the water above it becomes limpid, though of a yellowish tinge. When these signs are perceived, they indicate infallibly the success of the first operation. At this time, without touching the herb, the liquor impregnated with its tincture is let out, by cocks in the bottom, into another vat placed for that purpose, so as to be commanded by the first. The first vat is called the "sleeper;" the second and third are called the "beaters."

In the second vat, the liquor is strongly and incessantly beat and agitated, with a kind of buckets fixed to poles, till the colouring matter is united into a body. A good deal of nicety is requisite in hitting this point; if the beating is ceased too soon, a part of the tinging matter remains dissolved in the liquor; if continued a little too long, a part of that which had separated is dissolved afresh. The exact time for discontinuing the process is determined by taking up some of the liquor occasionally in a little cup, and observing whether the blue fecula is disposed to separate and subside.

The facility with which the grain precipitates to the bottom of the beater, is an unequivocal sign that the beating has arrived at the correct point.

The whole being now suffered to rest till the blue matter has settled, the clear water is let off, by cocks in the sides at different heights; and the blue part discharged by a cock in the bottom, into another vat. Here it is suffered to settle for some time longer, then farther drained in cloth-bags, or sacks, and exposed in shallow wooden boxes to the air, without exposing it to the sun, and carefully keeping it from the rain, till thoroughly dry.

Before it is perfectly dry, it is cut in small pieces of an inch square, which detach themselves readily from the box, when the indigo is entirely dry. Yet, however well drained and dried the indigo may be, it always experiences, in the first months of its fabrication, a diminution sufficiently evident to warrant a hastening of the sale. It is customary to pack the indigo in barrels, and thus to circulate it in commerce. Indigo is packed in sacks of coarse linen, and the sack is covered with an ox's hide, so hermetically sewed, that nothing can penetrate it. These packets are called "ceroons." They are much preferable to barrels, as they are more solid and more convenient for transportation. Two "ceroons" make the load of one animal.

The author above-mentioned, from whom the greatest part of the foregoing account is extracted, observes farther, that the goodness of the indigo depends greatly upon the age of the plant; that before it has grown fully ripe, the quantity it yields is less, but the colour proportionably more beautiful; that probably the secret of those whose indigo has been most esteemed, is no other than cutting the herb at the time when it yields the finest colour; that the superiority of some

some of the indigoes of the East Indies to those of America, is perhaps owing to the former being prepared more curiously from only the leaves of the plant; and that by beating the herb in the steeping-vat, which has been practised by some with a view to increase the quantity, great part of the substance of the leaves and bark is blended with the water along with the colouring matter, and the indigo extremely debased.

It is said that lime, or lime-water, is sometimes employed in the beating-vat, to promote the separation of the tinging particles from the water; and that the hardness or flintiness of some sorts of indigo is owing to an over proportion of this addition.

Pomet says, that the Indians of the village of Sarqueffe, near Amadabat, use only the leaves of the indigo, and throw away the plant and branches; and from thence the most esteemed indigo is brought.

Indigo is commonly divided, from the colour which it exhibits upon breaking, into three kinds, copper-coloured, purple, and blue. It is said that the dyers use chiefly the first; and the calico-printers (for this drug gives a durable stain to linen as well as woollen) the last. On what particular circumstances these different appearances depend, we know not; nor is it certainly known whether the real quality of the indigo has any connection with them. The deepest and liveliest blue indigo, rubbed with the nail, appears like polished copper; and solutions of all the sorts, made in alkaline lixivia, assume alike a copper-coloured skin upon the surface.

Good indigo is moderately light, breaks of a shining surface, and burns almost wholly away upon a red-hot iron. It is quickly penetrated by water, and reduced into a kind of paste; a considerable part is at the same time diffused through the liquor, and very slowly subsides. This is probably what Labat and Hellot mean by its dissolving in water; for no part of the indigo really dissolves; it cannot indeed be expected that it should, from the process by which it is obtained.

Indigo requires an equal quantity or more of fixed alkaline salt, to render it totally soluble in water. On digesting the indigo, with a gentle heat, in the solution of the alkaline salt, a shining copper-coloured skin begins to appear, and gradually covers the whole surface: on agitating the matter, a large blue flower or froth arises, and the liquor underneath appears of a deep green. If woollen cloth, without any other preparation than moistening it with warm water, be dipped in this hot liquor, it comes out perfectly green, and changes almost instantly in the air to a fine blue. This is the common process of dyeing blue.

Mr. Hellot describes two indigo vats with urine; one of which is used hot, like the foregoing, and the other cold. The hot vat consists of equal parts of indigo, alum, and tartar, digested in urine till the liquor becomes green. The cold one is prepared, by digesting powdered indigo with vinegar for twenty-four hours, in the proportion of four pounds to about three quarts; then mixing the matter with about fifty gallons of urine, and stirring the whole together every night and morning, till the liquor turns green, and gathers a head like the common vat.

Indigo is fitted for printing on linen, by diluting it with water into the consistence of a syrup; then adding some powdered pearl-ashes, green vitriol, and lime newly slaked; with so much water, occasionally, as will reduce them into the consistence of thin paint; mixing the whole thoroughly together, and stirring the matter every now and then, till it gains a copper colour on the surface. The proportions used by the workmen are, two parts of indigo, one of pearl-ashes, three of vitriol, and two of lime. The same compo-

sition, diluted with a sufficient quantity of water (about six gallons to a pound of indigo), and boiled, gives a durable blue to tanned skins, whether dipped in hot or cold.

Indigo digested in a moderate heat with different volatile alkaline spirits, gave only yellowish and brownish red tinctures; with rectified spirit of wine, a reddish one; to lime-water, and to water acidulated with the vitriolic, nitrous, and marine acids, it gave no tincture at all.

The concentrated vitriolic acid unites with it into a smooth paste, especially if the indigo is previously well ground with powdered glass, sand, or other like substances. The indigo is thus rendered soluble in boiling water along with the acid, so as to pass through the pores of a filter; the solution, whilst hot, appears of a deep bright green colour, like that made by fixed alkalies, but fades as it grows cold, and changes at last to a brownish. These experiments, which were many times repeated with the same event, seem to overturn Mr. Hellot's ingenious theory, which deduces the green colour of solutions of indigo from the common property of blue juices being turned green by alkalies; and the blue colour which the cloth acquires soon after it is taken out of the vat, from a separation of the alkali. We here find, that a green solution of this concrete is obtainable by the strongest of the acids, and that with volatile alkalies it discovers no tendency to greenness.

For the method of preparing *SAXON blue* and *SAXON green* from indigo, see those articles.

Indigo is sometimes used among the painters for paper-hangings, and such gross uses, who grind and mix it with white to make a blue colour; for without that mixture it would paint blackish.

They also mix it with yellow to make a green colour. It is also used in dyeing, and by the laundresses, to give a blueish cast to their linen.

In the *Hortus Indus Malabaricus* is an account of the plant whence indigo is drawn; the decoction of whose root is said to be excellent against nephritic colics; its leaves, applied to the abdomen, good to promote urine; and the indigo itself is said to be of good use in drying of tumours.

Some physicians have recommended indigo in the quantity of a drachm, while others look upon it as a poison; and in Saxony the internal use of it is prohibited.

INDIGO, Bastard. See *AMORPHIA*.

INDIGO Mills. For the purpose of effecting the solution and union of indigo with the liquid used along with it, for the purposes of dyeing, mills of various constructions are in use. In this process trituration or friction is as much as possible avoided, and the pulverization is effected merely by bruising. For this two very sufficient reasons may be assigned; the first, in point of economy, and the second, to avoid chemical inconveniency. On whatever substance the indigo was triturated or rubbed, a certain proportion of the stuff would be mixed or incorporated along with the pulverized indigo, and that proportion of indigo which was absorbed by this stuff would be either totally lost, or brought into union with another substance which might prove useless, and probably injurious in the subsequent process of dyeing. If the former only was the case, the absorbed indigo would be totally lost; if the second took place, the whole process might be utterly spoiled by the combination. In the appropriate plate, *fig. 1.* represents the ground or horizontal plan of such an indigo mill as is generally used in small dye-works, and which is occasionally turned by a man's or boy's hand. This is tedious and laborious, for the operation must be continued for a very long time before the indigo is sufficiently mixed with the liquid to be fit for use, and only a small

small quantity can be put into the vessel at once. *Fig. 2.* is an elevated section of the same mill.

In this machine the pulverization or granulation of the indigo is effected by the pressure of a number of smooth cast-iron balls, like those used for the shot of great guns, which, being rolled among the indigo, press it into a paste by their weight, until it unites with the liquid by which it is to be held in solution.

In *fig. 1*, A represents the bottom and rim of the vessel which contains the indigo, and which is of a cylindrical form. B is an upright spindle, which, in this figure, does not appear. Upon the spindle B is fixed a wheel C C, with a convenient number of arms projecting round the vessel, like the radii of a circle; and below each of these arms are projecting pieces of iron, like the pins or teeth of a harrow, for moving the balls. When this wheel C is moved round its axis, the whole balls in the vessel A are set in motion, and, by rolling over the indigo, gradually press it, until it unites with the water or liquid with which it is surrounded. If the bottom of the cylinder be flat, a very small part of the surface of each ball can act upon the indigo; but by casting circular hollow grooves, as represented in *fig. 2*, nearly the semi-diameter of the ball will press upon the stuff. The mill is moved by a handle D, *fig. 2*, which sets in motion the small bevel wheel E, and this wheel acting upon the horizontal wheel F, fixed upon the spindle B, sets it also in motion, and consequently the wheel C C is moved round its axis, and all the balls roll round upon the indigo. G is a cross shaft upon the top of the spindle B, loaded at each end with a heavy bail. There is generally another shaft placed at right angles to this, when they assist in regulating and equalizing the motion in the same manner as any other fly wheel. When the indigo is found to be sufficiently dissolved, and united with the water, the liquid thus formed is drawn off into any other vessel for use by means of a vent and spigot placed in any convenient part of the bottom of the vessel.

The great labour and time which it requires, and the small quantity of stuff which can be prepared at once by a machine of this kind, renders it ill adapted for the use of large works where much indigo is consumed, and where they have generally a horse-power water-wheel, or steam-engine, for raising water, cutting madder, and other purposes necessary in extensive works. *Fig. 3.* represents an elevated cross section of one of these machines, driven by any moving power, and capable of preparing a very great quantity of indigo at all times, as it requires no attendance, excepting to empty the vessel when the indigo is wanted, and add a fresh supply. H is a semi-circular vessel of cast-iron, placed upon a strong wooden frame O, and of any convenient length. I is a cover made in two pieces, with a circular aperture to admit the upright shaft K working upon the centre, or pivot P. At Q, the upright P is jointed to a horizontal shaft of wood M, the other end of which is connected by the joint R, with a crank fixed on the end of a horizontal shaft N driven by the moving power. The circular motion of the shaft and crank N communicates an alternate, or reciprocating motion, by means of the horizontal connecting shaft M, to the upper end of the upright shaft K, which vibrating upon the centre joint P, sets in motion the iron cylinders L, L, in the body of the vessel, which press upon the indigo, and produce the same effect, but to a much greater extent, as the balls in the machine first described. The cylinders L, L, may be made of any diameter or length which is found convenient. The greater mass of iron that they contain, the quicker and more effectual will be their operation upon the stuff, provided there is

a sufficient power to drive them. The frame under the joint P extends the whole length of the semi-circular vessel H, which may be any length, according to the extent of the power and quantity of work required. As this machine requires no attention whatever, it is found very useful in large dye works, as, by means of it, they can constantly command a large supply of prepared indigo, which may be drawn off when wanted, for the longer it is under the preparing process, the better in every respect, and fresh indigo may be added as the supply gets low.

INDIGOFERA, in *Botany*, yields the blue dye called Indigo or Indicum, so eminently useful in dyeing various manufactures of a blue colour. This substance obtained the name of indigo from its native country, India.—Linn. Gen. 383. Schreb. 506 Willd. Sp. Pl. v. 3. 1220. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 67. Juss. 359. Lamarck Dict. v. 3. 244. Illustr. t. 626. Gærtn. t. 148. Class and order, *Diadelphia Decandria*. Nat. Ord. *Papilionaceae*, Linn. *Leguminosae*, Juss.

Gen. Ch. Cal. Perianth of one leaf, spreading, almost flat, five-toothed. Cor. papilionaceous; standard rounded, reflexed, emarginate, spreading; wings oblong, obtuse, spreading at the lower margin, of the shape of the standard; keel obtuse, spreading, deflexed, marked on each side by an hollow awl-shaped point. Stam. Filaments in two bundles, disposed into a cylinder, ascending at their tips; anthers somewhat roundish. Pist. Germen cylindrical; style short, ascending; stigma obtuse. Peric. Pod roundish, long. Seeds numerous, kidney-shaped.

Eff. Ch. Calyx spreading. Keel of the corolla having an awl-shaped spur on each side! Pod linear.

Obs. Till within the last century it was but imperfectly made out what plants produced the dye known to the Romans by the name of *Indicum*. Mr. Miller, however, cultivated the *Indigofera* so early as 1731; but he was acquainted with only five species of it; which same number Linnæus imperfectly described. Professor Martyn enumerates thirty-five species, and Willdenow fifty-one; but since this genus is particularly known and esteemed for its utility in the arts, and that most of its species yield the blue dye, as well as many other plants of the same natural family, we shall merely give a general outline of the genus, without entering into a long systematic arrangement of the species.

The genus *Indigofera* is composed of shrubs and herbs, whose leaves are, in certain cases, simple, more generally ternate, but most frequently unequally pinnate. The leaflets in some species are jointed and awned at the base. Stipulas distinct from the leaf-stalk. Peduncles axillary, generally many-flowered, in spikes or bunches. Many species are natives of the Cape of Good Hope; for instance, *I. filifolia*, *sericea*, *dpressa*, *ovata*, *psoraloides*, *candicans*, *amara*, *incana*, *procumbens*, *sarmentosa*, *denudata*, *erecta*, *coriacea*, *filiformis*, *digitata*, *frutescens*, *stricta*, *angustifolia*, and *capillaris*.—The rest are either from the East or West Indies, Arabia Felix, New Holland, and the coast of Guinea.

It is said that Pliny was aware that *Indicum* was a preparation from a vegetable substance, though he was ill-informed both concerning the plant itself, and the process by which it is made fit for use. The following is a curious anecdote to shew that at the close of the 16th century it was unknown in England what plant produced Indigo, for in a book entitled "Remembrances for Master S. by Richard Hakluyt," written in 1582, Master S. is instructed "to know if Anile that coloureth blew, be a natural commodity of Turkey, and if it be compounded of an herbe—to send the seed or root with the order of sowing, &c.—that it may become a natural commodity

commodity in the Realm, as woad is (*Isatis tinctoria*), that the high price of foreign woad may be brought down."

I. tinctoria, Dyer's Indigo, is a native of the East and West Indies, Madagascar, Ceylon, Java, &c. Its stem is suffrutescent. Leaves pinnate, ovate. Bunches of flowers short. —Loureiro says it is cultivated all over the vast empires of China and Cochin-china. It is figured under the name of Ameri in the *Hortus Malabaricus*, v. 1. 101. t. 54.

INDIGOFEA. See **SOPHORA**.

INDIKKOD, in *Geography*, a town of Grand Bucharia; 60 miles W. of Balk. N. lat. 36° 38'. E. long. 64° 10'.

INDION, a town of Persia, in the province of Chorasan, near the Masjan; 210 miles N.N.E. of Herat.

INDIRECT MODES of Syllogisms, in *Logic*, are the five last modes, or moods, of the first figure, expressed by the barbarous words *baralipon*, *celantes*, *dabitis*, *fespame*, *fressom*.

It is the conversion of the conclusion which renders the moods indirect: for instance, a syllogism in *darii*, and another in *dabitis*, would be perfectly alike, were it not for that conversion; the propositions having the same quantity, and the same quality, and the middle term being the subject in the major, and the attribute in the minor, in both. It remains, then, that, to make a distinction, that which is the subject of the conclusion in *darii*, be the attribute in the conclusion of *dabitis*; and that which is the attribute in the first, the subject in the last. See **SYLLOGISM**.

DA. Every thing that promotes salvation is advantageous:

RI. There are afflictions which promote salvation:

I. Therefore there are afflictions which are advantageous.

DA. Every thing that promotes salvation is advantageous:

BI. There are afflictions which promote salvation:

TIS. Therefore some things promoting salvation are afflictions.

INDIRECT Confirmation. See **CONFIRMATION**.

INDISCERNIBLES, in the *Philosophy of Leibnitz*. See **LEIBNITZIAN Philosophy**.

INDIVIDUAL, **INDIVIDUUM**, in *Logic*, a particular being of any species; or that which cannot be divided into two or more beings, equal or alike.

The usual division in logic is made into genera or genuses, those genera into species, and those species into individuals. See **GENUS**, **SPECIES**, and **DIVISION**.

The schoolmen make a four-fold distinction of individuals; *viz.*

INDIVIDUUM Vagum, that which, though it signifies but one thing, yet may be any of that kind; as when we say a man, a certain person, or one said so and so; though but one person is meant, yet that person, for aught that appears to the contrary, may be any body.

INDIVIDUUM Determinatum is, when the thing is named and determined; as Alexander, the river Nile, &c. this is also called *individuum signatum*.

INDIVIDUUM Demonstrativum is, when some demonstrative pronoun is used in the expression; as, *this man*, *that woman*.

INDIVIDUUM ex Hypothesi, or by supposition, when an universal name or term is restrained, by the supposition, to a particular thing: as when we say, the son of such a one, and it be known that he had but one son.

INDIVISIBLES, in *Geometry*, those indefinitely small elements, or principles, into which any body or figure may be ultimately resolved.

A line is said to consist of points, a surface of parallel lines, and a solid of parallel and similar surfaces; and because each of these elements is supposed indivisible, if in any figure

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a line be drawn through the elements perpendicularly, the number of points in that line will be the same as the number of the elements.

Whence it appears, that a parallelogram, prism, or cylinder, is resolvable into elements, as indivisible, all equal to each other, parallel, and like to the base; and a triangle into lines parallel to the base, but decreasing in arithmetical proportion; so also are the circles which constitute the parabolic conoid, and those which constitute the plane of a circle, or the surface of an isosceles cone.

A cylinder may be resolved into cylindrical curve surfaces, having all the same height, and continually decreasing inwards, as the circles of the base do, on which they insist. This way of considering magnitudes, is called the method of indivisibles, which is only the ancient method of exhaustions, a little disguised and contracted.

It is found of good use in shortening mathematical demonstrations; of which we may give an instance in that famous proposition of Archimedes, that a sphere is two-thirds of a cylinder circumscribing it.

Suppose a cylinder, an hemisphere, and an inverted cone (*Plate VIII. Geometry, fig. 102.*) to have the same base and altitude, and to be cut by infinite planes all parallel to the base, of which *d g* is one; it is plain, the square of *d h* will every where be equal to the square of *k c* (the radius of the sphere) the square *b c* = *e h* square; and, consequently, since the circles are to one another as the squares of the radii, all the circles of the hemisphere will be equal to all those of the cylinder, deducting thence all those of the cone; wherefore the cylinder, deducting the cone, is equal to the hemisphere; but it is known, that the cone is one-third of the cylinder, and consequently the sphere must be two-thirds of it.

Cavalleri was the first person who introduced this method of indivisibles into one of his works, entitled "Geometria Indivisibilium," printed in 1635; which he also made use of in another tract published in 1647.

INDIVISO.—*Pro INDIVISO*. See **PRO**.

INDIVISUM FOLIUM. See **LEAF**.

INDO-SCYTHIA, in *Ancient Geography*, a district of India, that lay on the western side of the river Indus, extending as far as the river Coas, or Cow river, and at present inhabited in part by those who are probably descendants of the Scythian Nomades, and called *Nomurdy*.

INDOCTORUM PARLIAMENTUM. See **PARLIAMENTUM**.

INDORE, in *Geography*, a town of Hindoostan, in the Malwa country, and residence of a Mahratta chief; 200 miles S.S.W. of Agra. N. lat. 22° 56'. E. long. 76° 11'.

INDORSEMENT, any thing written on the back of a deed or instrument. See **ENDORSEMENT**.

A condition written on the back of an obligation is commonly called an indorsement: from *in*, and *dorsum*, back.

INDORSEMENT of a Bill of Exchange. See **ENDORSEMENT**.

INDOS, in *Geography*, a town of Hindoostan, in Bengal; 16 miles E.N.E. of Bissunpour. N. lat. 23° 10'. E. long. 87° 53'.

INDOUR, a town of Hindoostan, in Tellingana; 15 miles N.W. of Indelavoy.

INDRA, in *Mythology*, is deemed, among the Pagan East Indians, the first of the demi-gods; and seems generally to rank in importance next to the three chief deities that form the Hindoo Trimurti. (See **TRIMURTI**.) The history of this first of their *dii minores* might be extended through several volumes; and, indeed, including the fables

connected with the motley history of this personage, many volumes thereon are extant among the Hindoos. He is said, in their theogony, to be the offspring of Kasyapa and Aditi (see KASYAPA), and has the whole firmament under his regency. In many particulars he corresponds with the Joves or Jupiters, for there were a great many among the Greeks and Romans; more especially, perhaps, with Jupiter Pluvius, for Indra is the god of showers. The Hindoos fancy the visible heavens to be under the guidance of eight genii, collectively called Marûts, or the Winds. (See MARUT.) Of these, Indra is the principal, and he rules the eastern quarter. He may be deemed a personification of the firmament, ruling all atmospheric or meteoric phenomena. As god of thunder he is named Vajra Pani, or Lightning Sender; his disk-shaped weapon, *vajra*, represents lightning. He resides in the celestial city Umravati; his palace, Vajrayanta, is situated in the garden Nandana, which contains also the all-yielding trees Pariyataka, Kalpadruma, and three others similarly bountiful. He possesses also the all-prolific cow Kamdenu, otherwise called Surabhi; and hence one of Indra's names means the *lord of wealth*. He has a consort named Indrani: he rides the elephant Iravat, with three proboscis, which are said to represent water-spouts, as the bow with which he is armed is the iris. Seated on mount Meru, or the north pole, attended by male and female dancers (Sînâra and Upsâra), he regales the gods with nectar and heavenly music. He is painted with four arms, and spangled with eyes; hence one of his names is the *thousand-eyed* god. Another of his names is Purendera, or the *destroyer of towns*; he having, in revenge for supposed neglects, overwhelmed several cities; particularly Ujaini, or Oojein, the capital of Malwa.

INDRA *Malwa*, the hereditary possession of the family of Sindia. The city has now lain submerged about 1900 years. (See OOJEIN.) Indra is also named Shatkratû, meaning he to whom is made a *hundred sacrifices*, for this "king of the immortals," another of his names, is very extensively propitiated in the numerous ceremonies of lustration and sacrifice that Brahmans, devoted to the service of the altar, are daily called upon to observe. Jealous, however, of the offerings made to other deities, he is represented as frequently interrupting, both by personal interposition and evil counsel, the sacrifice prepared or intended for other deities: in this character of an evil counsellor he is usually called Sakra, and although called and represented as *thousand-eyed*, he is sometimes painted with but one eye; the cause of which, with many other fables connected with the character and history of this important deity, is related in Moor's Hindoo Pantheon, whence most of the particulars of this article are taken.

Like most of the other Hindoo deities, Indra is represented as immoral and depraved, even to a proverbial degree; but we must refer to the work just mentioned for instances of his profligacy, excessively extravagant if received literally, but which, doubtless, are allegorical concealments of some astronomical or physical facts; for major Moor proves Indra to be a star or a constellation of the northern hemisphere, and that the wars which he sustains against giants, in which he is alternately conqueror and conquered, refer to some cycle or periodical revolution of the heavenly bodies. Metallic images of Indra are rarely seen: he is sculptured in Elephanta and other excavations in India, mounted on Iravat, and is often met with in paintings. Several engravings of him are given in the Hindoo Pantheon. Under the words severally referred to above, and the foreign names of persons and places that occur, farther particulars of the subjects of this article will be found; for Indra is so important a deity,

that his history, like his worship, mixes itself with that of most of his divine associates in the monstrous system of Hindoo idolatry.

INDRANI, is the name of the Sakti or consort (see SAKTI) of Indra, the regent of the firmament among the Hindoos. (See INDRA.) Her name is sometimes pronounced Aindrani. She is otherwise called Pulomaya, or Powlamya, and Saki, and is represented in the Hindoo Puranas, or mythological and theogonical romances, as a faithful and virtuous character, which is not always the case with their female divinities: she is also very handsome, and has resisted many temptations. She is called one of the seven divine mothers of the celestials. (See MATRI.) In the sixth volume of the Asiatic Researches, is a very curious and interesting account by sir Charles Malet, of the magnificent excavations at Ellora, accompanied by plates; one of them representing Indrani, of lovely form, seated on a lion, with a child in her lap, and a skull and cross bones in her girdle: major Moor, however (Hindoo Pantheon, p. 271.), doubts if this elegant figure be really of Indrani, of whom he says he never saw any sculptured representation. See ELLORA; to our account of which may be added, that Mr. Daniel has engraved and published, from materia's in the collection of sir Charles Malet, a series of views, both minute and perspective, of the interior and exterior of these wonderful excavations, that is altogether unrivalled by any work in Europe, as well for the accuracy of oriental scenery and costume, as for its general elegance and splendour.

INDRAPOUR, in *Geography*, a town on the W. coast of the island of Sumatra, and capital of a country, which has several other towns, where the Dutch have a factory for the purchase of pepper, 100 miles N. W. of Bencoolen. S. lat. 2°. E. long. 100° 40'. This was once the seat of a monarchy of some consideration and extent. Its antiquity appears from an historical account given by the sultan of Bantam to Corneille le Brun, in which it is mentioned, that the son of the Arabian prince, who first converted the Javans to Mahometanism, about the year 1400, having got himself declared sovereign of Bantam, married the daughter of the raja of Indrapour, and had, as her portion, the territory of the Sillabares, a people of Banca-houlou. This was probably the first dismemberment which the Javan monarchs long availed themselves of; and since, the kingdom of Indrapour has dwindled into obscurity. From its ruins has sprung that of Anacfoongey; extending on the sea-coast from Mandoota river to that of Oori; the present capital of which, if such towns deserve the appellation, is Moco Moco. Marfden's Sumatra, p. 284.

INDRAPOUR *Point*, a cape on the W. coast of Sumatra. S. lat. 2° 10'. E. long. 100° 34'.

INDRAT, a town of Hindoostan, in Dowlatabad; 23 miles N.W. of Beder.

INDRE, a river of France, which rises about four miles N. N. W. from Bouffac, in the department of the Creuse; and joins the Loire at Rigny, between Saumur and Tours.

INDRE, one of the departments of the central region of France, formerly Lower Berri, in N. lat. 46° 45', so called from the river which traverses it from S.E. to N.W.; bounded on the N. by the department of the Loir and Cher, on the E. by that of the Cher, on the S. by the departments of the Creuse and Upper Vienne, and on the W. by those of the Vienne and Indre and Loire, about 54 miles from N. to S., and 5 from E. to W. Its capital is Chateauroux. It contains 362 square leagues, and 207,911 inhabitants; it is divided into four districts, viz. Issoudun, containing 39,341 inhabitants; Chateauroux,

75,588; La Chatre, 45,171; and Le Blanc, 47,811. Its cantons are 23, and communes 275. Its contributions amount to 1,652,606 francs; and its expences to 219,394 fr. 59 cents. The western district of this department abounds in rocks, pools, and woods; but the other tracts, and in particular that on the right hand of the Indre, consist of cultivated fields, vineyards, &c. yielding grain, wine, and pastures; it has mines of iron, marble quarries, and mineral springs, &c.

INDRE and LOIRE, one of the nine departments of the western region of France, formerly Touraine, in N. lat. 47° 10', so called from the union of the two rivers: bounded on the N. by the department of the Sarthe, on the E. by the departments of the Loire and Cher and the Indre, on the S. and S.W. by the department of the Vienne, and on the W. and N.W. by the department of the Mayne and Loire; about 50 miles from N. to S., and 45 from E. to W. Its capital is Tours. It contains 325 square leagues, and 278,758 inhabitants. It is divided into three districts, viz. Tours, including 128,635 inhabitants; Loches, 57,094; and Chinon, 93,029. Its cantons are 24, and communes 311. Its annual contributions amount to 2,868,779 francs, and its expences to 246,653 francs. This department, on account of its fertility, has been styled the garden of France. The vallies and eminences near the borders of the large rivers are fertile, but at some distance are heaths and uncultivated tracts. The district lying between the Loire and the Cher is of a light and sandy, but productive soil. The peninsula formed by the Indre, the Loire, and the Vienne, is noted for its fertility. A tract, called Brenne, is moist, but tolerably fruitful. The principal products are rye, barley, millet, wine, fruits, and pastures. It has mines of iron, and mineral springs.

INDU, a name of the moon among Hindoo mythologists. This luminary is more commonly called Chandra, or Soma. (See SOMA.) It has been surmised that the name India and Hindoo, words unknown in the ancient language of the country, may have been derived from Indu; but sir William Jones and Mr. Wilkins discountenance such an etymology. See Moor's Hindoo Infantide, p. 171.

INDUCEMENT, in *Law*, is what is alleged as a motive or incitement to a thing; and it is used specially in several cases: viz. there is inducement to actions, to a traverse in pleading, a fact or offence committed, &c. Inducements to actions need not have so much certainty as in other cases: a general *indebitatus* is not sufficient, where it is the ground of the action; but where it is only the inducement to the action, as in consideration of forbearing a debt until such a day; (for that the parties are agreed upon the debt) this being but a collateral promise, is good without shewing how due.

INDUCIARUM PETITIO. See PETITIO, and EMPARLANCE.

INDUCTION, in *Logic* and *Rhetoric*, a consequence drawn from several propositions, or principles, first laid down.

Thus the conclusion of a syllogism, is an induction made from the premises. See SYLLOGISM.

INDUCTION is also used for a kind of syllogism itself; being a medium between an enthymeme and a gradation, in regard it wants a proposition (which, however, is understood,) as in the enthymeme; and abounds in assumptions (which yet are collateral, or of the same degree), which is the case in a gradation.

For instance; every terrestrial animal lives, every aerial animal lives, every aquatic animal lives, and every reptile animal also lives; therefore every animal lives.

Here, it may be observed, are various assumptions, from the more general species of the animal kind collected into one; which this proposition is supposed to precede; *c. gr.* that every animal is either terrestrial, aerial, aquatic, or reptile.

Suidas reckons three kinds of induction: that just mentioned, which concludes or infers some general proposition from an enumeration of all the particulars of a kind, he calls the *dialectic* induction.

The second proceeds by interrogation, and concludes probably, or with a verisimilitude; this is what the Greeks called *παραγωγὴ*, and was that which Socrates ordinarily made use of, as Cicero, in his Topics, and Quintilian have observed: and, therefore, called the *Socratic* induction. This, however, is a captious way of reasoning: for while the respondent is not aware of what is designed to be inferred, he is easily induced to make those concessions, which otherwise he would not. Besides, it is not so well suited to continued as to interlocutory discourses.

The third kind of induction is properly *rhetorical*; being a conclusion drawn from some example, or authority.

This is a very imperfect induction, all its force lying in a proposition which is concealed, and which will hardly bear being expressed. Thus, he that says, Codrus died bravely for his country, therefore I must die bravely for my country; proves nothing, unless this proposition be carried in mind, that I must do the same with Codrus. Again, Archimedes, and the other mathematicians, say, the sun is much bigger than the earth; therefore, it must be owned, the sun is much bigger than the earth. Where this proposition is understood, viz. whatever Archimedes, and the other mathematicians, say, is true.

Induction is one of the four forms of reasoning used by orators in confirmation; the other three are syllogism, enthymeme, and example, which last coincides with the third species of induction above enumerated.

INDUCTION, in the *English Laws*, is usually taken for the giving possession to an incumbent of his church, by leading him into it, and delivering to him the keys, by the commissary, or bishop's deputy, and by his ringing one of the bells.

When a clerk is instituted into a benefice, he is to exhibit his mandate from the bishop to the archdeacon, or other person to whom it is directed, and hath a right thereby to be inducted into his living; and if he be refused induction, he hath a remedy both in the ecclesiastical court, and also an action of the case in common law, against the archdeacon. If the inductor, or person to be inducted, be kept out of the church, or house, by laymen, the writ *de vi laica* lies for the clerk, which is directed out of the chancery to the sheriff of the county, to remove the force, &c. If another clergyman, presented by the same patron, keep possession, a spoliation is grantable out of the spiritual court, whereby the tithes, &c. shall be sequestered, till the right be determined.

The archdeacon rarely inducts a clerk in person, but usually issues out a warrant to the clerks and lettered persons within the archdeaconry, empowering any of them to do it in his stead.

An induction made by the patron of the church is void; but bishops and archdeacons may induct a clerk to the benefices of which they are patrons, by prescription. No induction is necessary to a donative, where the patron, by donation in writing, puts the clerk in possession without presentation.

11 Hen. IV. cap. 7.

The usual form and manner of induction is, for the inductor to take the clerk by the hand, and then to lay it

on the key of the church, which must be then in the door, and to say, "By virtue of this instrument, I induct you in the real, actual, and corporal possession of the rectory or vicarage of —, with all its fruits, profits, members, and appurtenances."—This done, he opens the door, and puts the clerk in possession of the church, and shuts the door upon him; who, after he hath tolled a bell (if there be any) to give the parishioners due notice and sufficient certainty of their new minister, comes out, and desires the inductor to indorse a certificate of his induction on the archdeacon's warrant, and that all present will signify it under their hands. If the church-key cannot be had, it is sufficient that the clerk lays hold of the ring of the door, the latch of the church, gate, &c. and, within two months after this, the clerk must read the thirty-nine articles, and all the service of the day, both at morning and evening prayers, in the parish church of his benefice, and in the time of common prayer, and declare his assent and consent: he must also then read the ordinary's certificate, in which is the declaration of his conformity, together with the same declaration, and of all this he must have two or three good witnesses, who must sign that they heard him do it, and be ready to attest it, *viva voce*, if required; and, within six months after induction, he must also take the oaths of allegiance, supremacy, and abjuration, at the quarter-sessions, or in some one of the courts at Westminster-hall.

Induction makes the parson complete incumbent, and fixes the freehold in him. When a clerk is thus presented, instituted, and inducted into a rectory, he is then, and not before, called in law, *persona impersonata*, or parson imparfonée. 13 Eliz. c. 12. 13 and 14 C. II. c. 4. 1 Geo. stat. 2. c. 13. 9 Geo. II. c. 26. 23 Geo. II. c. 28.

INDULGENCE, in the *Romish Theology*, the remission of a punishment due to a sin, granted by the church, and supposed to save the sinner from purgatory.

The Romanists found their indulgences on the infinite treasure of the merits of Jesus Christ, the Holy Virgin, and all the saints; which they suppose the church has a right of distributing by virtue of the communion of saints. See SUPEREROGATION.

These indulgences were first invented in the eleventh century by popes Gregory VII. Victor, and Urban II. as a recompence for those who went in person upon the wild enterprize of conquering the Holy Land. See CROISADE.

They were afterwards granted to those who hired a soldier for that purpose, and in process of time were bestowed on such as gave money for accomplishing any pious works enjoined by the pope. In the beginning of the twelfth century, the bishops, whenever they wanted a supply of money for their private pleasures, or the exigencies of the church, resorted to the scandalous traffic of indulgences; and when the Roman pontiffs saw that immense treasures were thus accumulated by the inferior rulers of the church, they thought proper to limit the powers of the bishops in remitting the penalties imposed upon transgressors, and assumed it, almost entirely, as a profitable traffic to themselves. They began with granting a plenary remission of all the temporal pains and penalties which the church hath annexed to certain transgressions; and then proceeded to abolish even the punishments which are reserved in a future state for the workers of iniquity.

The Roman jubilee, first instituted by Boniface VIII. A.D. 1300, carries with it a plenary, or full indulgence, for all the crimes committed therein.

The pope also grants bulls of plenary indulgence to several churches, monasteries, and even to private persons; and it is

a frequent thing to have general indulgences for the time of the principal feasts of a year. Their casuists say that a plenary indulgence does not always prove effectual, for want of complying with the conditions whereon it was granted.

For the extirpation of heretics, it has been a common practice with the popes to grant indulgences. Thus Clement XII. "That we may stir up and encourage the faithful to extirpate this ungracious crew of forlorn wretches, (the Cevenois, when in arms against Lewis XIV.) we fully grant and indulge the full remission of all sins, whatever they may be (relying upon that power of binding and loosing, which our Lord conferred upon his chief apostle), to all those that shall lift themselves in this sacred militia, if they shall happen to fall in battle." See ABSOLUTION.

Julius II. had bestowed indulgences on all who contributed towards building the church of St. Peter at Rome, and pope Leo X. in order to carry on this magnificent structure, published indulgences, and a plenary remission on the same pretences. Finding the project take, he granted the right of promulgating these indulgences in Germany, together with a share in the profits arising from the sale of them, to Albert, elector of Mentz, and archbishop of Magdeburg, who employed Tetzel, a Dominican friar, as his chief agent for retailing them; and he farmed out those of other countries to the highest bidders, who, to make the best of their bargains, procured the ablest of their preachers to extol the value of the ware: "Happy times for sinners," says a modern writer, "their crimes were rated, and the remission of them set up by auction. The apostolic chamber taxed sins at a pretty reasonable rate; it cost but ninety livres and a few ducats, for crimes which people on this side the Alps punished with death."

These are specified in a book of rates called the Tax-Book of the Holy Apostolic Chancery, first printed at Rome in the year 1514, and ascribed by some to pope Innocent VIII. From a correct edition of this book, printed by L. Banck, professor at Norkopia, in Gothland, in 1651, it appears that the price of absolution for fornication, attended with the most heinous circumstances, was six grossi or groats; for a layman's murdering a layman, five greats; for laying violent hands on a priest, without shedding blood, nine groats; for committing incest, five groats; for a priest's keeping a concubine, seven groats; for forging the pope's hand-writing, seventeen or eighteen groats. See the *Taxa S. Cancellariæ Apostolicæ*, a L. Banck. Franequeræ, 1651, p. 126, &c. It was this great abuse of indulgences, that contributed not a little to the first reformation of religion in Germany; wherein Martin Luther began first to declaim against the preachers of indulgences, and afterwards against indulgences themselves: but since that time, the popes have been more sparing in the exercise of this power; however, they afterwards carried on a great trade with them in the Indies, where they were purchased at two reals a-piece, and sometimes more. See REFORMATION.

INDULGENCE, or *Indulto*, signifies also a special favour, or privilege, conferred either on a community, or a particular person, by the pope's bulls; in virtue whereof the party is licensed to do or to obtain something contrary to the intention and disposition of the common laws.

There are two kinds of *indultos*: the one *active*, which consists in a power of nominating and presenting freely, and without reserve, to benefices that are otherwise limited, and restrained by the laws of the apostolical chancery; such are those ordinarily granted to secular princes, cardinals, bishops, &c.

Passive *indultos* consist in a power of receiving benefices, and

and expectative graces; of which kind are those of a parliament, of graduates, mandataries.

The *indulto* of kings is the power given them of presenting to consistorial benefices, either by treaty, by favour, or special privilege.

The *indulto* of cardinals is a licence for holding regular as well as secular benefices, and for disposing of benefices in *commendam*, or continuing them, &c.

Indulto of parliament is a right of privilege formerly granted to the chancellor, presidents, counsellors, and other officers in the parliaments of France, to obtain a benefice of the collator, upon the king's nomination directed to him. This was a kind of advowson, or patronage, belonging to the French king; the *indulto* being a mandate, or grace, by which he was permitted to name to any collator he pleased a counsellor, or other officer of parliament, on whom the collator should be obliged to bestow a benefice: so that the right of the *indulto* resided radically in the king, the officers being only the objects thereof.

INDULPHUS, in *Biography*, the seventy-seventh king of Scotland, began his reign in the year 959. The early years of his reign were peaceable and prosperous, but afterwards his kingdom was invaded several times by the Danes, who were enraged against him for making an alliance with the English. Their first descent was upon East Lothian, whence they were soon expelled, but crossed over to Fife. Here they were defeated, and driven out, and so well had Indulphus taken care to guard the coasts, that they could find no other opportunity of invading the country; till, having thrown the Scots off their guard, they made good their landing in Banffshire. Here Indulphus attacked them in their camp, and drove them towards their ships, but was killed in an ambuscade, into which he fell during the pursuit.

INDULTO, in *Commerce*, denotes a duty, tax, or custom paid to the king of Spain for all such commodities as are imported from the West Indies in the galleons.

INDURATING, a term applied to such things as give a harder or firmer consistence to others, either by the greater solidity of their particles, or by dissipating the thinner parts of any matter, so as to leave the remainder harder.

INDURATION of STRATA, in *Geology*, denotes the change which all the masses of the earth evidently have undergone since they were deposited in their present situation in a fluid or plastic state; under the article **HARDENING** of Strata, we have noticed some of the facts and theories on this subject, to which we beg to refer.

INDUS, or **SINDÉ**, or, according to the proper Sanscrit name *Sindhoo*, under which name it was not unknown to the Romans (*Indus incolis Sindus appellatur*, Pliny, l. vi.) a celebrated river of Asia, which is formed of about 10 principal streams, that descend from the mountains of Persia, Tartary, and Hindoostan, on the N.E. and N.W.; all which streams, uniting near Moultan in Hindoostan, form this famous river. The Ayin Acharee says, the Sindé, according to some, rises between Cashmere and Cashgar, whilst others place its source in Khatai, meaning probably Koten, the Chatae of Ptolemy, and not China. It is clear, however, that the people of Hindoostan consider the northern branch as the true Sindé, though the ancients seemed to have reckoned otherwise; for Pliny says "in jago Cauca montis, quod vocatur Paropamisus, adversus Solis ortum effusus." The emperor Baber, indeed, applies the name of Sindé to one of its western branches, that springs near Bamian, but he appears to differ in this particular from the rest of his countrymen; for the name of Nilab, which was ap-

plied to the river that ran by the site of Attock (long before that city was founded), was applied also to the same river, in its course through Little Thibet; and Nilab is synonymous with Sindé. (See **NILAB**.) The Indus, under the name of Nilab, passes through the country of Little Thibet; and its head must be on the west of the great ridge of mountains called by the ancients Imaus, because on the east of it, the rivers all run in a direction opposite to that of the Indus. About 20 miles above Attock, the periodical rains, which fell on the northern mountains, having considerably swelled the river, its breadth was about $\frac{3}{4}$ of a mile; its course rapid and turbulent, and its water extremely cold, with a great quantity of black sand suspended in it. At Attock the Indus is joined by the Cabul, and very considerably increased by it, so that from Attock downwards to Moultan, or to the conflux of the Panjab waters, where it has obtained the name of Attock, it is no longer fordable; below that point it is called Soor, or Shoor, until it divides itself into a number of branches near Tatta, where the principal branch takes the name of Mekran. This river, however, when spoken of generally, is called Sindé; although particular parts of it are known by different names. The Indus, and its branches, admit of an uninterrupted navigation from Tatta, the capital of Sindy, to Moultan and Lahore, for vessels of near 200 tons. About 170 miles from the sea, by the course of the river, the Indus divides into two branches, of which the westernmost is by much the largest. This branch, after a course of about 50 miles to the S.W., divides into two more; the smallest of which runs in a W.S.W. course, to Larry-Bunder and Dacraway; and the largest, taking the name of Ritchel river, runs in a more southwardly course to the town or village of Ritchel, on the sea-coast. The other principal branch is that which bounds the eastern side of the Superior Delta; separating, as we have said, about 170 miles from the sea. It is smaller than the Ritchel river, but larger than that of Larry-Bunder, and according to circumstances and report, it opens into the mouth of the gulf of Cutch, nearly opposite to Jigat point; its course being somewhat to the eastward of south. Major Rennell infers from various circumstances, that the Delta of the Indus (see **DELTA**) is about 150 British miles in length along the sea-coast, and about 115 in depth, from the place of separation of the superior branches of the river, to the most prominent point of the sea-coast. The lower part of this Delta is intersected by rivers and creeks in almost every direction, like the **DELTA** of the Ganges, but without trees; the dry parts being covered with brushwood, and the remainder, being by much the greatest part, being noisome swamps, or muddy lakes. The upper part of the Delta is well cultivated, and yields abundance of rice. This Delta is set apart for the breeding of camels, answering this purpose by means of the tender parts of its brushwood, which serves them for fodder. The breadth of the Ritchel branch is estimated at one mile, just above the tide; and at Tatta, at only half a mile. It is certain that the Indus is very considerably less than the Ganges. The velocity of its current is estimated at four miles per hour in the dry season; but this is supposed by Rennell to be over-rated. The course of the Indus river is stated by major Rennell at (probably) $6\frac{1}{2}$, that of the Thames being 1. This ingenious geographer mentions the moveable towns or villages that are situated on the banks of the river, noticed by Nearchus and the Ayin Acharee; some of which are the habitations of fishermen, and others of graziers; which are continually changing their positions like a camp. Few rivers abound more with fish than the Indus does; and among these are some very delicious sorts. The mouths of the

Indus

Indus are comprehended between N. lat. 23° 20' and 24° 40'.

INDUSTRY, *Fruits of*. See FRUITS.

INEADA, in *Geography*, a town of European Turkey, in Rumania; 56 miles E.N.E. of Adrianople.

INEQUALITY of *Natural Days*. See EQUATION.

INEQUALITY, *Optical*. See OPTICAL.

INERT Vegetable Matter, in *Agriculture*, is a term lately given to that sort of vegetable matter which, by long and frequent exposure, has been so saturated and combined with the oxygen or pure air of the atmosphere, as to be rendered in a great degree insoluble. The surface of peat mosses, and the mould of such soils as have been much exposed to the action of pure air, by fallowing, are supposed to be rendered inert in this way by the author of the "Connection of Chemistry with Agriculture." See PEAT.

INERTIÆ Vis. See Vis Inertia.

INESCUTCHEON, in *Heraldry*, a small escutcheon borne in a larger one, as part of some other coat. See ESCUTCHEON.

Guillem confines the name to an escutcheon borne single in the fess point or centre.

This is also sometimes called an *escutcheon of pretence*.

He who marries an heiress, bears her coat of arms on an *inescutcheon*, or *escutcheon of pretence*, in the middle of his own coat.

Modern heralds apply the name inescutcheon to those small escutcheons, several of which are borne in a large one.

INESERRHA, in *Geography*, a town of Africa, in Sennaar; 10 miles E. of Giesien.

INESSE is applied to things which are actually existing.

Authors make a difference between the thing *in esse*, and a thing *in posse*. A thing that is not, but may be, they say, is *in posse*, or *potentia*; but a thing apparent and visible, they say, is *in esse*, that is, it has a real being *eo instanti*; whereas the other is casual, and at best but a possibility.

INEVERAM, in *Geography*, a town of Hindooستان, in the circar of Rajamundry; 32 miles S.E. of Rajamundry.

INFALISTATIO, an ancient punishment of felons, by throwing them among the rocks and sands, customarily used in port-towns. It is the opinion of some writers, that *infalifatus* did imply some capital punishments, by exposing the malefactor upon the sands till the next tide carried him away; of which custom, it is said, there is an old tradition. However, the penalty seems to take its name from the Norman *salese*, or *salefia*, which signified not the sands, but the rocks and cliffs adjoining, or impeding on the sea-shore. "Commisit feloniam ob quam fuit suspensus, utlagatus, vel alio modo morti damnatus, &c. vel apud Dover infalifatus, apud Southampton submersus, &c."

INFALIBLE, from *in*, taken privatively, and *fallō*, I deceive, that which cannot deceive or be deceived.

Upon this term stands one of the principal heads of controversy between the Reformed and the Catholics; the latter of whom maintain, that the church, assembled in general council, is infallible; which the former deny.

The Jesuits, in their disputes with the Jansenists, have expressly asserted that Jesus Christ hath given to all popes whenever they shall speak *à cathedra*, the same infallibility which he had, both in matters of right and fact.

The principal reasons alleged for the infallibility, are drawn from the promises of Christ, from the obscurity

of the scriptures, the insufficiency of private judgment, and the necessity there is of some infallible judge for the decision of controversies.

The infallibility of the pope is a doctrine of a late standing, and has not been entirely acquiesced in, even in their own communion, and altogether rejected by the Gallican church. See POPERY.

INFAMOUS, derived from *in*, and *fama*, fame, report, in the ordinary use of the word, signifies something notoriously contrary to virtue, or honour.

Aulus Gellius uses the word *infames materias*, for what we ordinarily call *paradoxes*, i. e. discourses remote from the common opinion; propositions that appear opposite to truth, &c. as the elogy of Theristes, the praise of a quarrelsome man, &c.

INFAMOUS, in *Law*, denotes a person or thing, which is of no repute, or esteem, in the world.

There are two kinds of infamy: some persons being infamous as having been noted by the laws, or stigmatized by public judgment.

Infamy, which extends to forgery, perjury, gross cheats, &c. disables a man to be a witness or juror: but a pardon of crimes restores a person's credit to make him a good evidence. Judgment of the pillory makes infamy by the common law, but by the civil and canon law, if the cause for which the person was convicted was not infamous, it infers no infamy.

Others are held infamous, by the exercise of some scandalous profession; as a catepole, a merry-andrew, a hangman, an informer, &c.

Hence there were crowns of infamy given, by way of punishment, to criminals: they were made of wool.

INFANCY. See INFANT.

INFANT, in a *Law sense*, a person under the age of one-and-twenty years, whose acts are in many cases either void or voidable. (See AGE) All gifts, grants, &c. of an infant, which do not take effect by delivery of his hand, are void; and if made to take effect by delivery of his own hand, are voidable by himself and his heirs; and those who shall have his estate.

Although an infant, under 21, can make no deed which is not afterwards voidable; yet in some cases he may bind himself apprentice by deed indented, or indentures for seven years (stat. 5 Eliz. c. 4. 43 Eliz. c. 2. Cro. Car. 179); and he may by deed or will appoint a guardian to his children, if he has any. Stat. 12 Car. II. c. 24.

By the custom of London, an infant, unmarried, and above the age of fourteen, may bind himself apprentice to a freeman of London, by indenture, with proper covenants, which shall be binding.

An infant may bind himself to pay for necessaries, as meat, drink, apparel, physic, and learning, but not by bond with penalty; though a bill for necessaries, without a penalty for the very sum due, it is said, will bind him. Infants are not obliged to pay for clothes, unless it be averred for their own wearing; and that they were convenient and necessary for them to wear according to their degree and estate. An infant may buy, but cannot borrow money to buy necessaries; for the law will not trust him with necessaries, but at the peril of the lender, who must lay it out for him in necessaries, or see it thus laid out.

An infant has been adjudged of age the day before his birth-day; for the law will not make a fraction of a day; therefore where a person was born the third of September, and the second of September, twenty-one years after, he made his will, it was held good, and that he was then of age to devise his lands. And it is said such will shall

take effect, though the devisor dies by six at night of that day.

An infant eight years of age, or upwards, may commit homicide, and be hanged for it, if it appear, by any other act, that he had knowledge of good and evil; for here *malitia supplebit aetatem*: yet Coke on Littleton, sect. 405, says, "An infant shall not be punished till the age of fourteen;" which, according to him, is the age of discretion.

But this depends on the degree of judgment which he possesses. If an infant be *infra annos infantie*, viz. seven years old, he cannot be guilty of felony, whatever circumstances proving discretion may appear. See AGE, in *Law*, EXECUTOR, GUARDIAN, &c. See also RAPE.

An infant *en ventre sa mere*, or in the mother's womb, is capable of having a legacy, or a surrender of a copyhold estate made to it. It may have a guardian assigned to it (stat. 12 Car. II. c. 24.); and is enabled to have an estate limited to his use, and to take afterwards by such limitation, as if it were then actually born (stat. 10 & 11 W. III. c. 16.); and in this point the civil law agrees with our's. Though infants cannot alien their estates, yet infant trustees or mortgagees are enabled to convey, under the direction of the court of chancery or exchequer, or other courts of equity, the estates they hold in trust or mortgage, to such person as the court shall appoint. By the custom of gavel-kind, an infant, at the age of fifteen, is reckoned at full age to sell his lands; and by custom, in some places, an infant seised of land in socage, may, at the same age, make a lease of years, that shall bind him after he comes of age.

An infant, who has an advowson, may present to the benefice when it becomes void. (Co. Litt. 172.) An infant is capable of inheriting, and may also purchase lands, but his purchase is incomplete; for, when he comes to age, he may either agree or disagree to it, without alleging any reason; and so may his heirs after him, if he dies without having completed his agreement. (Co. Litt. 2.) And in case any infant bargain and sell his land by deed, indented and enrolled, yet he may plead non-age.

If an infant grants leases for a term of years, he may, at his full age, either confirm the lease, or bring trespass against the lessee for the occupation. Also a lease granted to an infant, may be avoided by waiving the land before the rent-day expressed therein. However, infants are bound in all acts of necessity; as presentations to benefices, admissions and grants of copyhold estates, assenting to legacies, and conditions annexed to lands, whether the estate comes by grant or descent. If an infant be the defendant in an action, the plaintiff shall have six years for commencing his action, after the defendant comes of age; and an infant, who is a plaintiff, has also six years after he comes of age, to sue by the statute of limitation.

INFANTS, Diseases of, in Medicine. When the extreme delicacy and tenderness of every part of the structure of the infant frame is considered, as well as the extraordinary revolution, which it suddenly undergoes, in passing from its vegetating state, as it were, in the uterus, to that of a breathing animal, it must be obvious that a thousand circumstances, which make no impression on the adult frame, will powerfully influence that of the infant; and that the utmost care will be required to shield it from numerous causes of disease, from the moment of its birth. To the neglect of these circumstances, and to their inability of attending to them, the great mortality that occurs among the children of the poor, in large cities, is perhaps chiefly to be ascribed. But this was formerly much augmented, among all ranks, by the absurd and unna-

tural interference of art, which was apparently dictated by a notion that the instincts and intimations of nature were to be opposed, as of the most baneful tendency. Fortunately the more rational system of following these intimations, as the best guides to health, has generally superseded that abuse; and it will only be requisite for us here to speak of some of the accidents attendant on birth, of the more frequent con-nate imperfections of structure, and of the diseases peculiarly belonging to the period of infancy and childhood.

Recovery of still-born or weakly infants.—Dr. Hamilton observes, that the occasional recovery of still-born children, under circumstances where experience alone could have encouraged any hopes, ought to teach practitioners the importance of employing, with patience and attention, the means conducive to that purpose. If there is no pulsation in the umbilical cord, the infant should be instantly separated from the mother, the cord being tied by a slip knot, and the body immersed in warm water. The lungs should be then distended with air, by means of a bag of elastic gum, or a common syringe, (the pipe of which is to be inserted into one nostril, while the other and the mouth are carefully closed,) and again emptied by gentle pressure on the breast. In this way an alternate distention and compression of the lungs should be continued for some time. Should the action of the heart be now perceived, the same means are to be continued, until the infant exhibit the usual marks of beginning respiration; when the artificial distention of the lungs is to be only occasionally repeated, and all pressure on the breast is to be avoided. But if, notwithstanding these means, the pulsation of the heart be not restored, the infant should be taken out of the warm water, placed before the fire, carefully rubbed, and then wrapped in warm flannel. A glyster, consisting of a table-spoonful of spirits, and two or three table-spoonfuls of warm water should then be administered, and the temples, nostrils, and teguments of the face round the mouth, should be gently touched with a feather, dipped in vitriolic æther, or spirits of hartshorn. But, secondly, if the pulsation in the cord of a still-born child is distinct and soft, and the infant has the natural appearance, so long as the placenta remains attached to the uterus, the child ought not to be separated from the mother. The body should be carefully wrapped in warm flannel, the nostrils and fauces should be touched with a feather dipped in vitriolic æther, and a little spirits rubbed on the breast. If the after-birth become detached, (which is known by the lengthening of the cord,) the child must be immediately separated, and the above means employed. Should the process of breathing commence after these means have been used for a few minutes, nothing else is to be done than keeping the infant warm, with its face freely exposed to the air. But should this not take place, the lungs are to be distended and again compressed, as in the first case. See Prof. Hamilton's Hints on the Diseases of Infants, &c.

Although alive when born, the infant, in some instances, lives only a short time. If the lips be pale, and the pulsation in the heart very feeble or slow, it may be suspected that this originates from some cause which is not cognizable to the senses. On the supposition that it arises from a deficiency of vitality, stimulants have been applied to the surface, as a little brandy, or spirits of hartshorn, rubbed on the ribs and spine, &c.: and such means have occasionally proved efficacious, though in the majority of cases they fail. When the extremities are of a purple or blueish colour, and the breathing is impeded or unnatural, it is generally found that there is a defect in the heart or lungs, which is beyond the power of any remedy.

§ 1. *Connate Imperfections.*—Children are not always born in a state of perfection in respect to the structure of their bodies; for sometimes they have deficient, superfluous, or misplaced parts, natural passages closed, and various marks on the surface. Many of these imperfections admit of no remedy; while others may be easily rectified. The following are those which are most frequently met with.

Fissures in the lips not only constitute a remarkable deformity, but commonly prevent the child from sucking. They appear under various forms. Sometimes the fissure exists only in one lip, generally the upper one, and is occasioned merely by a division of the soft parts: in other cases, there is a considerable loss of substance between the divided parts: in some instances, again, there are two fissures in one lip, or both lips are affected: and in others, the fissure is not confined to the lips, but extends along the roof of the mouth. All these different species of the same deformity receive the general name of *hare-lip*; which see.

The tongue is naturally bound down to the lower part of the mouth by a membranous cord, to prevent it from too great a degree of motion. Sometimes, however, the cord fixes it so much, that the infant cannot suck, in which case it is commonly said to be *tongue-tied*. Women very often imagine that their children have this defect, when it does not really exist: and perhaps one instance of it does not occur in several hundreds of those that are born. The disease may be always discovered by putting a finger gently into the child's mouth; for if he be able to grasp it, as he would do the nipple in sucking, or if the tip of the tongue appear disengaged, the membrane does not require to be cut. The operation of dividing the *frænum*, trifling as it may appear, requires some caution, in order to avoid wounding the sublingual veins, and cutting too deep; for in the first case, a fatal hæmorrhage may ensue; and in the second, if the tongue is loosened too much, the tip may be turned back, and close up the throat; an accident that must soon occasion death. It may be discovered by the threatening suffocation or convulsions, and by the introduction of the finger into the mouth, by which also the tongue may be pulled back, and the consequences avoided. This, however, is a very rare accident: it has been absurdly called "swallowing the point of the tongue." See Underwood on the Diseases of Children, vol. ii. p. 17. 5th edit.

The *natural passages*, especially the *anus*, *vagina*, and *urethra*, are sometimes *imperforate*, preventing altogether, or in great part, the usual excretions. In some cases, a collection of mucus alone proves the obstacle; but in others, membranous substances close up the passages, in which last instances, an operation will be requisite to open the parts, which must be performed by a skilful surgeon. In respect to the *vagina*, Dr. Underwood observes that he never found the external parts totally imperforate, there being always a small opening at the *meatus urinarius*: but the aperture to the *vagina* itself sometimes requires to be opened, either by the point of a lancet, or by the fingers only, which is generally easily effected, there being always a *raphé*, or line, where the natural opening should be. The *anus* is sometimes closed only by a thin membrane, so that the day after birth the meconium may be distinctly felt, and in a manner seen shining through it. A slight puncture with a lancet, and passing a bougie or the point of a finger into the bowel for two or three days afterwards, is sufficient to remove this impediment. But more commonly the imperforate anus is a melancholy case, allowing of no effectual remedy, as the gut often terminates in a cul-de-sac: so high as not to be reached. The imperforate penis is not quite so com-

mon a case; but is not unfrequently suspected, when the aperture of the passage is merely stopped up by a little mucus. Under such circumstances, washing the part with warm milk and water, or at most a little assistance with a small probe, or any such blunt-pointed instrument, will be sufficient to open the passage. When the urethra is perfectly open nearly to the extremity, as often happens, it is necessary only to make a small aperture with a lancet, or a fine trocar, and to keep the part open by the occasional introduction of a slender bougie.

Tumours about the back-bone of infants are always dangerous. If they be soft, partly transparent, and obviously connected with the spine, constituting the disease called *spina bifida*, or *hydrorachitis*, they most generally prove fatal ultimately; although in some instances, the progress to that event has been very slow, the child having lived to the thirteenth year. Fortunately, however, it more commonly terminates within a few months after birth: where it is protracted, the individual is in a miserable state, being paralytic in his lower limbs, &c.

Retention of the Meconium.—The meconium is that black, viscid matter, which every infant discharges from the intestines for the first two or three days after birth; and many complaints have been ascribed to the undue retention of it, and consequently a great variety of purgative medicines have been recommended to be given, almost as soon as the child is born, with a view to expel it. But experience has taught that the natural evacuant of this matter is the first milk of the mother, which is slightly laxative in its properties: the infant, therefore, should be put to the breast as soon after birth as the situation of the mother will allow. The pernicious practice of giving infants purging medicines, Dr. Hamilton remarks, as soon as they are born, cannot be too much reprobated; for the retention of the meconium for some hours after birth certainly produces less inconvenience than is occasioned by the acrimony of the substances which the child is often forced to swallow. The most simple artificial means, he adds, for removing this matter, are Lisbon sugar dissolved in water, or a solution of manna. Where these fail, a teaspoonful of cold drawn castor oil is to be given.

Jaundice, or, as the nurses term it, the *yellow gum*, is among the diseases which take place within a few days after birth. It is preceded by drowsiness, and disinclination to suck, and is soon discovered by the universal yellowness of the skin. Sometimes the whites of the eyes appear yellow for a day or two before the other symptoms appear: the tinge of the skin is seldom deep, and the disease is more readily removable than the jaundice of adults; but cases are occasionally met with, where the colour of the skin is of a dark yellow, the infant moans constantly, and convulsions follow, which at last destroy life. In regard to the treatment of this disease, if the child seem to suffer no uneasiness, although its skin be quite yellow, and if his bowels be open, it will be unnecessary to administer any medicines. But if he be unable to suck, and have a disposition to constant sleep, active measures should be adopted. These consist principally in evacuating the viscid matter, which probably clogs up the biliary ducts. An emetic of ipecacuan, and brisk laxatives, as of rhubarb, or frequent doses of a solution of manna, will then be found necessary, and their effects may be much promoted by the warm bath. When violent colic pains or convulsions accompany the yellow gum, there is reason to fear that the liver is diseased, and little can be expected from any remedy.

The *thrush*, fore mouth, or *aphthæ*, is so common a disease in early infancy, that it has been imagined to be a salutary effort

effort of nature to expel some hurtful matter from the system, which might otherwise be productive of many complaints at a future period. This opinion, however, is merely a vulgar prejudice, founded neither on reason nor experience. *Aphtha* appear to be connected with a deranged condition of the alimentary canal, and seem to arise most frequently from the too early or too liberal use of spoon-meat, or improper food: but other causes occasionally produce it, such as exposure to cold, damp weather, &c. In the treatment of this complaint, Dr. Hamilton affirms, that the great object should be to promote its natural progress, and to counteract the effects of the acrimony of the saliva. The early use of stimulant applications, such as gargles of port-wine and borax, force off the spots before they have undergone the natural changes, and by their irritation keep up the disease. But the proper objects may be obtained by putting frequently into the infant's mouth a tea-spoonful of a liquor, prepared by mixing with the white of an unboiled egg, three table-spoonfuls of cold water, and a little refined sugar, by prohibiting all spoon-meat, and by frequently dousing the natural passages with prepared calamine or tutty powder. When the spots become yellow, the borax may be allowed. It is to be mixed with eight or ten times its weight of powdered sugar or of honey, or it may be dissolved in fig-tea in the same proportion. If the spots grow livid, bark and port-wine should be used as a gargle, while the infant is supported by means of ten or twelve parts of warm cow's milk, mixed with one part of sherry wine. The same kind of nourishment is necessary in cases, where, from the extensive incrustation over the tongue and cheeks, the infant is incapable of sucking, which often happens for a day or two. See *APHTHÆ*.

§ 2. *Diseases of the Skin*.—Two diseases, of a febrile nature, connected with a morbid condition of the skin, have been described by writers on the disorders of infancy, which merit attention. They are almost unknown, however, except to the physicians of lying-in hospitals, as they have seldom occurred in the private houses of individuals. The first of these is erysipelatous inflammation of the skin, called by Dr. Underwood *erysipelas infantile*, which ordinarily occurs within a few days after birth, and sometimes at a later period. It seizes the most robust, as well as delicate, children; making its attacks in a very sudden manner, and proceeding rapidly in its course. It most commonly appears first on the toes or fingers, which look swelled and blue, as if from cold; but in the more violent forms, it begins about the pubes, and extends upwards on the belly, and down the thighs and legs; or sometimes it commences in the neck, when it is equally dangerous. It appears, indeed, to be always most dangerous when it seizes or spreads to the body, and most mild when confined to the extremities. Suppuration and gangrene are occasionally the consequences; but even where neither of these events takes place, it may terminate fatally from effusion into some of the cavities, or from the inflammation extending to the contents of the abdomen, glueing the parts together, and throwing out upon their surface an exudation of coagulable lymph. On the whole, the treatment of this infantile *erysipelas* has too frequently proved unsuccessful. The use of saturnine lotions and poultices, on the first appearance of the inflammation, seemed to check its progress at first; but it was soon found to spread, and to terminate in a fatal suppuration or mortification. A more cordial plan of treatment has been attended with a somewhat greater degree of success; and the application of external stimulants, such as linen compresses wrung out of camphorated spirit, has in some cases checked the inflammation. The bowels should be kept open,

and the free admission of pure air enforced: indeed, it is probable that, in proportion to the effectual ventilation employed, the occurrence of the disease will be diminished, and its violence, when it does appear, mitigated.

Another affection of the skin, accompanied by fever, and occurring under similar circumstances, has been called by Dr. Underwood, who was one of the first to describe the disease, the *skin-bound disease*. This does not happen invariably, like the preceding complaint, within a short time after birth; for it has been known to attack infants above six months old. It is ushered in with violent fever, with coldness of the limbs, oppressed breathing, and almost constant moaning. The skin is of a yellowish-white colour, resembling soft wax in its appearance, and not only thickened and hardened, but evidently unyielding; the cellular membrane is fixed in such a manner that it will not slide over the subjacent muscles, not even on the back of the hands, where it is usually very loose and pliable. This stricture often extends over the whole body; but the skin is peculiarly rigid in the parts about the face, and on the extremities. The child is always cold, and whatever number of days it may survive, has constantly the appearance of being in a dying state. The stools are of a clayey colour and consistence; and the disease seems to be much connected with a disorder of the chylopoietic organs, especially of the liver. The free use of laxatives, together with the warm bath, and some cordial medicines, appears to have been occasionally successful; but in general, where the progress of the disease has not been arrested in the commencement, it has terminated fatally.

The most common affections of the skin, however, that occur in early infancy, are unaccompanied by fever, are productive only of slight inconvenience, without danger, and consist principally of certain rashes, or eruptions of papular or pustular spots. The most common of these is a papular eruption, which appears under a variety of forms, and has been called the *gum*, or technically *strophulus*. Dr. Willan has distributed those varieties of appearance under five heads: the most frequent of which is the *red gum* (or *red gown*, as it was formerly denominated, probably because the child's skin, thus variegated, somewhat resembles a piece of red printed linen), the *strophulus intertriginus*. The *papulae*, or pimples, in this affection, rise sensibly above the level of the cuticle, are of a vivid red colour, and commonly distinct from each other: their number and extent vary much in different cases. They appear most constantly on the cheeks, fore-arm, and back of the hand, but are sometimes diffused over the whole body. This eruption has not in general any tendency to become pustular, but usually terminates in scurf, or exfoliations of the cuticle. Its duration, however, is very uncertain: the papulae and spots sometimes remain for a length of time without any alteration; sometimes disappear and come out again daily: but for the most part, one eruption of them succeeds another, at longer intervals, and with more regularity. The red gum occurs chiefly within the two first months of lactation: it is not always accompanied or preceded by any disorder of the constitution, but appears occasionally in the strongest and most healthy children. In many instances, it is connected with a weak irritable state of the alimentary canal, and consequent indigestion. For if it be, by any means, suddenly repelled from the surface, diarrhoea, vomiting, spasmodic affections of the bowels, and often general disturbance of the constitution, succeed; but as soon as it reappears, those internal complaints are wholly suspended. Dr. Armstrong and others have particularly noticed this reciprocation, which makes the *red gum* at times a disease of

some importance, though, in its usual form, it is not thought to be in any respect dangerous. On their remarks a necessary caution is founded, not to expose infants to a stream of very cold air, nor to plunge them unseasonably in a cold bath; the most violent and even fatal symptoms having often been the consequence of such imprudent conduct. Little need be said in regard to the treatment of the *red gum*: the common mild appearance of it, being consistent with a healthy state of all the functions of the body, requires no medicinal application. It is, however, advisable to keep the skin clear from *sordes*, and to promote equable perspiration. This may be done best by daily ablutions with tepid water, which prove useful in most cutaneous disorders, and will be found of considerable importance with respect to the general health of the infant.

The other varieties of *strophulus*, mentioned by Dr. Willan, are two, the *S. albidus*, or *white gum*, which differs from the former merely in the appearance of its papulæ, which consist of a number of minute, whitish specks, a little elevated, and sometimes, though not constantly, surrounded by a slight redness, occurring chiefly on the face, neck, and breast, and being more permanent than the papulæ of the *red gum*. 3. *S. confertus*, or *rank red gum*, sometimes also called the *tooth-rash*, which usually takes place about the fourth or fifth month after birth, on the cheeks and sides of the nose, extending sometimes to the forehead and arms, but rarely to the trunk of the body, and accompanying the state of dentition; and in the seventh or eighth month assuming a somewhat different form, appearing in one or two large irregular patches, of a high red colour, on the arms, shoulder, or neck. 4. *S. volaticus*, which is characterised by small, circular patches, or clusters of papulæ, arising successively on different parts of the body, continuing red, with a little heat or itching, for about four days, when they turn brown, and begin to exfoliate; the successive patches, however, not ceasing to appear in less than three or four weeks. And, 5. *Strophulus candidus*, in which the papulæ are larger than in any of the foregoing species, have no inflammation round their base, and a very smooth and shining surface, whence they appear to be of a lighter colour than the adjoining cuticle; they are diffused, at a considerable distance from each other, over the loins, shoulders, and upper part of the arms. This eruption affects infants about a year old, and most commonly succeeds some of the acute diseases to which they are liable, such as catarrhal fever, or inflammations of the bowels or lungs: the papulæ continue hard and elevated for about a week, and then gradually subside and disappear. See Willan on Cutan. Diseases, Order 1. Genus 1.

The *strophulus volaticus* being sometimes connected with a disorder of the stomach and bowels, it becomes requisite to administer a gentle emetic or some laxative medicines; after which the decoction of Peruvian bark will be found of advantage: No external application seems necessary. The *strophulus confertus*, when the child is otherwise healthy, is generally ascribed to a state of indigestion, or some febrile complaint in the mother or nurse: but the eruption is frequently seen when no such cause for it is evident. It may with more probability be considered as one of the numerous symptoms of irritation, arising from the inflamed and painful state of the gums in dentition; since it always occurs during that process, and disappears soon after the first teeth have cut through the gums. On this view the eruption requires no specific consideration in medical practice; it can only be alleviated by the general treatment proper for the state of teething, to be mentioned presently.

This species of *strophulus* appears under other modifications, which have been mistaken for measles. One very ob-

stinate and painful form of it is noticed by Dr. Willan, which takes place, though not often, on the lower extremities. The papulæ spread from the calves of the legs to the thighs, *nates*, loins, and round the body as high as the navel: being very numerous and close together, they produce a continuous redness over all the parts above-mentioned. The cuticle presently becomes shrivelled, cracks in various places, and finally separates from the skin in large pieces. During this process a new cuticle is formed, notwithstanding which the complaint recurs in a short time, and goes through the same course as before. In this manner, successive eruptions take place during the course of three or four months; and perhaps do not cease till the child is one year old, or somewhat more. Children necessarily suffer great uneasiness from the heat and irritation occasioned by so extensive an eruption; yet, while they are affected with it, they often remain free from any internal or febrile complaint.

This appearance, Dr. Willan remarks, should be distinguished from the *intertrigo* of infants, which exhibits an uniform red, smooth, shining surface, without papulæ; and which affects only the lower part of the *nates* and inside of the thighs, being produced by the stimulus of the urine, &c., with which the child's clothes are almost constantly wetted. Under the head of *intertrigo*, however, we must include all those varieties of *chafing* and *excoriation* which occur in those parts where the skin is folded, or in contact, and therefore liable to considerable attrition. (See INTERTRIGO.) From the delicate structure of the skin of infants, Dr. Hamilton observes, *excoriations* readily take place wherever one part of it is in constant contact with another, unless the most careful attention be paid to keep every part dry. The ears, neck, arm-pits, and groins are chiefly liable to be affected in this manner. When the excoriations are not allowed to continue for a considerable length of time, they seldom require any other treatment than being dusted, morning and evening, with prepared tummy, or calamine, or with common ashes finely powdered, or a little hair-powder or starch. But when a discharge of matter is the consequence of neglected excoriations, a cure can only be obtained by much care and attention; for it is often very difficult to stop these runnings. Some practitioners have objected to such attempts, on the false supposition that the discharge is a salutary outlet for an overload of the system. These opinions, admirably well calculated to favour the carelessness of nurses, are founded upon improper views of the operations of nature.

Many different remedies will be found beneficial in different cases of excoriation; such as washing the parts daily with brandy and water, lime-water, a weak solution of sugar of lead, or of white vitriol, and dressing them with any mild ointment, as spermaceti ointment, Turner's cerate, or ointments containing the oxyd of zinc, or a small portion of the ointment of nitrate of mercury. While these means are pursued, an open state of the bowels is to be promoted, by the occasional exhibition of any gentle laxative, as manna dissolved in water, &c. The use of mild mercurials, as alteratives, such as the hydrargyrus cum creta, &c. is likewise beneficial.

Some other slight eruptions, to which young children are liable, chiefly of the papular form, are mentioned by Dr. Underwood, and require no other treatment than attention to the state of the bowels, or the use of some testaceous powders. See his Treatise on Dis. of Children, vol. i.

There is a very common eruption, says the writer just quoted, that calls for more attention, and to which medical writers have given the name of *crusta lactea*, (or *milk-blotches*, as Dr. Hamilton translates it,) "which has a very unpleasant appearance, but is, notwithstanding, equally innocent with

with the former, and even prevents other complaints. I think I never saw an infant," he continues, "much loaded with it, but it has always been healthy, and cut its teeth remarkably well: indeed it falls to the lot of the finest children, and such as are well nourished; whence some have imagined it owing only to the richness of the milk. And it is remarkable in this eruption, that howsoever thick and long-continued the scabs may be, the *crusta lactea* never exco-riates, nor leaves any scar on the parts." It is not attended with any fever, or obvious derangement of the system. The crust appears first on the forehead, and often extends half way over the face in the form of large loose scabs. It is sometimes attended with severe itching. Practitioners in general affirm that medicines are not required, and are rather injurious than beneficial in this eruption; that mild laxatives, so as to keep the passage of the bowels free, may be employed, but that all active purgatives are to be avoided; and, lastly, that where there is excessive itching, some weak cooling astringent lotion, of the acetate of lead, or sulphate of zinc, should be applied to the parts. Dr. Underwood denies that the *crusta lactea* ever degenerates into scald-head, as some authors before him had mentioned. But Dr. Hamilton has pointed out a modification of *crusta lactea*, which frequently takes place during teething, and is a most obli-viate and troublesome complaint. "This," he says, "is characterized by a redness of the skin round the edge of the incrustations; by an ichorous or clear-coloured exudation issuing from the surface of the scabs, which concretes, and which tends to carry the disease over every part of the face which it touches. There cannot be a doubt, indeed, that this form of *crusta lactea* is contagious, and nothing less than a variety of the scald-head, or *tinea capitis*, the *Porrigio* of Dr. Willan's nomenclature, in which this species is called *Porrigio larvalis*. The cure of this modification of the disease requires constant ablution with milk and water, thin gruel, &c., to remove the acrid fluid which exudes, and the application of some drying ointment. Some alterative preparation of mercury is likewise useful internally, such as the hydrargium creta, or the grey oxyd, followed by the vegetable and mineral tonics. See *PORRIGO*.

Dr. Hamilton has stated the following practical conclusions respecting the eruptions of children in general. They may all be divided into two classes, he observes, the *first* of which are temporary, or of short duration; are commonly ushered in with symptoms of general indisposition, and are owing to some disorder of the stomach or bowels, or to some interruption of the usual excretions or secretions: the *second* are of an indefinite duration; break out gradually without any derangement of the ordinary health; and are probably, in most instances, the effects of some diseased condition of the lymphatic system, though, sometimes, they may be occasioned by a local affection of the skin itself. The treatment requisite in these two forms of eruption is thus stated. In the *first* class, where symptoms of indisposition, such as heat, restlessness, sickness, or oppression, are followed by an eruption, a brisk dose of calomel should be first ordered, together with the warm bath, and afterwards occasional purgatives, and a suitable regulation of the diet, are to be advised. But, in the *second* class, where the appearance of the eruption is unaccompanied by fever or marks of indisposition, some of the medicines called alteratives, and the daily use of warm bathing, particularly in sea-water, should be recommended. The medicines to which an alterative power is ascribed, he continues, are preparations of mercury, of antimony, of sulphur, and of neutral salts; and therefore calomel in very small doses, or antimonial wine, or the sulphuret of antimony, or Harrowgate or Cheltenham

waters, or some imitation of these, are the remedies to be chiefly depended upon. It is commonly necessary to order a protracted course of these medicines. In some cases, other topical applications (besides the warm bath) are necessary, to allay irritation, arising from excessive heat and itching of the skin. The most efficacious are lime-water mixed with oil, a solution of potash, and the acetate of ammonia much diluted. The metallic solutions are too powerful to be employed, except upon very particular occasions. Issues have been often employed in those cases, but experience has proved that purging answers better. Very distressing effects have followed the application of a blister, where there was a tendency to chronic eruptions of the skin. Hamilton's Hints for the Treatment of the principal Diseases of Infancy and Childhood, p. 130.

§ 3. *Dentition*—It is generally admitted that the time of *teething* is an important period of the infant state, during which a number of disorders of a formidable character are liable to occur. Dr. Cadogan, indeed, and Dr. Armstrong seem to have entertained a somewhat different opinion upon this subject, and have ascribed the complaints, connected with the process of dentition, to some other morbid condition of the habit, such as too great fulness, or a corrupt state of the fluids: but this appears to be a difference only in terms, and implies an admission of the occurrence of the diseases alluded to. (See Armstrong on the Diseases most incident to Children, &c. p. 61.) It is certain that the natural process of dentition is productive of pain and indisposition in by far the greater number of instances: some infants, indeed, suffer less than others, but few enjoy perfect health while teething. We shall first describe the progress of the development of the teeth, and afterwards the ordinary affections which it excites in the constitution.

The *period of teething* is subject to considerable variety in different instances; but in the greater number of cases, the first pair of milk-teeth appear between the fifth and tenth month, and the last before the end of the second year. In some infants, however, the first pair or two are cut by the end of the third month; while, on the other hand, not a few attain the sixteenth or eighteenth month before a single pair appears. In general, those of the lower jaw are cut before the corresponding ones of the upper jaw; but sometimes the several pairs of the upper jaw are cut before those of the lower. The following is the order of succession in most instances: *viz.* first, the two middle fore-teeth of the lower jaw; then the corresponding pair in the upper; next follow the two adjoining teeth of the upper jaw; and, after these, the two next fore-teeth of the lower jaw: then come the two foremost grinders of the upper jaw, and after them the two anterior grinders of the lower jaw: the two eye-teeth make their appearance next; and some time after, the two opposite to them in the lower jaw: and finally, the posterior grinders. Of the first set of teeth there are twenty in all, but in some cases only sixteen: an interval of one, two, or more weeks is interposed between each successive pair; and there is commonly a longer interval between the first two pair than between the succeeding ones. Some children, however, cut their teeth cross, as it is called, or irregularly, the teeth appearing first in the upper jaw, and also at a distance, instead of being contiguous to each other: in some rare cases the grinders come out before the cutting teeth. This is accounted, and with some reason, an indication of difficult or painful dentition.

At birth the teeth are placed underneath the gums, and each tooth is inclosed in a fine membrane or capsule, which is supposed to be extremely sensible. This capsule, as well as the gum, must give way before the tooth can be protruded;

and this is accomplished merely by the pressure of the enlarging tooth, which occasions the absorption of those parts. In favourable cases, the pressure of the teeth on the gums occasions pain, and an increased flow of the fluids furnished by the mouth. Hence the infant is fretful, restless during the night, drivels continually, and frequently thrusts his little hands, or whatever he can get hold of, into his mouth, to rub his gums; and he has occasionally sickness, gripes, and looseness. At last the corner of a tooth is perceived; but the uneasiness still continues for some days, when a second one is cut. During the interval between the cutting of the lower and upper teeth, he recovers his strength and usual good health; but is soon again subjected to the same uneasiness.

Were these the only complaints which attend teething, little danger might be apprehended; but sometimes many very formidable symptoms occur. In robust healthy constitutions, a violent fever frequently precedes the appearance of every tooth; the gums are swelled and inflamed, the eyes much affected, the belly bound, the skin hot; and there is every now and then continued screaming, with inability to suck, and the sleep is short and disturbed. Weakly infants, where teething is painful and difficult, are oppressed with sickness, loath all kinds of food, lose their colour, fret perpetually, have a constant looseness, and become much emaciated. Some, besides these symptoms, are subject to convulsions, which recur from time to time, till the tooth or teeth are above the gum. In others, cough, various eruptions on the skin, ulcerations in the gums, extending sometimes over the palate, oblique inflammation of the eyes, affections of the urinary organs, and sometimes most alarming determination to the head, are occasionally the effects of teething. All the symptoms are much aggravated, if several teeth be cut at once, or in immediate succession.

It is of great importance to be able to ascertain when any of the distressing symptoms, thus enumerated, arise from dentition. This is to be done by a careful examination of the state of the gums. Previous to the protrusion of any tooth, the seam, which may be distinctly observed on the edge of each gum, like a doubling of the skin, is done away, and the upper surface of the gum is rendered flat and broad, or is elevated in the form of a small swelling. The gum of the upper jaw is more apt to appear on the stretch than that of the lower. It is not easy to distinguish when the infant suffers pain from any part of the gum being pressed upon; otherwise that might assist in pointing out the advance of some particular tooth or teeth, because such a degree of fretfulness attends teething, that every attempt to feel the state of the mouth never fails to irritate the child.

An estimate of the danger attending dentition is to be formed chiefly from the nature of the symptoms. Experience proves that puny delicate infants often suffer less than the most healthy and robust. In this climate it has been found that summer is a more favourable season for teething than winter. Some infants cut their fore-teeth without any pain or difficulty, but are much distressed while cutting the grinders or eye-teeth; although, when the protrusion of the first two pair of fore-teeth is accompanied or preceded by great uneasiness, there is reason to fear that the individual will suffer during the whole period of teething: yet the converse of the proposition does not hold good; that is, where little derangement of health attends the first pair or two, it is not to be concluded that all the other teeth are to advance with the same facility. It is well known, that during teething every acute disease is more than usually dangerous; and it is also a well established fact, that infants, in a crowded

city, are more liable to pain and alarming symptoms at that time of life than those reared in the country.

The treatment of the ordinary complaints attending teething, should consist in moderating the pain, in regulating the state of the bowels, and in the continued employment of every means calculated to promote the general health of the infant. With these views, small quantities of anodyne balsam may be rubbed on the back-bone at bed-time, when the infant seems to be greatly pained. He ought to be fed with beef-tea twice a-day, if weakly, and if his bowels be loose; and should be kept as much as possible in the open air when the weather is favourable; the cold bath ought not to be laid aside in these cases, unless other concurrent disorders should render it necessary, as nothing is more conducive to promote general strength. Looseness, if excessive, must be moderated; and if the belly be bound should be artificially induced by gentle laxative medicines. When restless during the night, the child should be taken out of bed, and carried about in a cool airy room; and if not relieved in a short time, he ought to be put into a warm bath. Finally, he should be allowed something to rub his gums with, which will both gratify his wishes, and tend to promote the absorption of the parts inclosing the tooth. A piece of wax-candle, or of recent liquorice-root, is preferable to coral; though the latter substance is in no other respect injurious than that it may be, by awkwardness, forced into the nostril or eye.

The management, when alarming symptoms take place, must be varied according to circumstances; but in every case the indications to be fulfilled are, to cut asunder the parts which resist the protrusion of the tooth or teeth, and to palliate distressing or troublesome complaints. Some of these, which occur also under other circumstances, will be noticed immediately. See also DENTITION. Hamilton's Hints, &c. p. 73, *et seq.*

Canker of the mouth, cancerum oris, as it has been called, is most commonly connected with dentition; it is sometimes troublesome to remove, but commonly a trivial complaint. It sometimes makes its appearance in the first month, Dr. Underwood says; at others, about the time of teething; and frequently at the age of six or seven years, when children are shedding their first teeth, and the second are making their way through the gums. It consists of little foul sores covering the gums, and extending sometimes to the inside of the lips and cheeks. It is said to occur during teething most frequently where the gums have not been lanced. It is generally easily cured by keeping the body open, and by the use of some mild astringent application to the mouth. As much white vitriol, or rock alum, as will give a moderate roughness to a little honey, is usually sufficient for this purpose; or if it should not effect a cure when the complaint makes its appearance at the time of teething, it will generally go away as soon as the teeth are protruded. The worst species of this complaint, witnessed by Dr. Underwood, has occurred during the second period of dentition, when a child has been shedding a number of teeth together, leaving the decayed stumps behind, which have been neglected to be drawn out. The whole gums will then sometimes be spongy, or dissolve into foul spreading ulcers; and small apertures will be formed, communicating from one part to another, accompanied with an oozing of a fetid and sometimes purulent discharge. If the stumps of the decayed teeth are easily accessible, they ought to be extracted, and some astringent applications made to the parts, consisting of myrrh, Peruvian bark, alum, or crystals of tartar, made into a paste with honey of roses, or lotions made with the same ingredients, astringent tinctures, or mineral acids.

§ 4. *Bowel Complaints.*—Under this head we shall include

the disorders of the whole of the alimentary canal, and of the organs connected with it, both by function and structure. These constitute, perhaps, the most important tribe of the diseases of children; inasmuch as they not only produce considerable distress by their direct effect in deranging the functions, but are likewise indirectly the source of numerous, severe, and even fatal constitutional maladies, both chronic and acute. The disorders of the stomach, indeed, are seldom very formidable or troublesome in early life; but the derangements of the biliary secretion, of the intestinal canal, and of the mesenteric glands and absorbents, which are much connected with each other, are productive of much mischief during the whole period of infancy and childhood.

Sickness and Vomiting—A slight degree of sickness is a very common occurrence in infants, as their stomach is so irritable, that it readily rejects any overload of food. But this spontaneous puking is attended with little violence to the stomach; the milk, or other aliment, seems to come up without any sensible action of the part, or any reaching effort of the child: and when the food is brought up immediately after sucking or feeding, and in an almost unchanged state, such sickness is observed to be not incompatible with a thriving state. Unless when the sickness is extremely violent, therefore, or long continued, it is seldom necessary to interfere. But when means are required to moderate or to allay it, we must endeavour to ascertain the cause of the vomiting, and apply them accordingly. The causes of sickness at the stomach in infants are either some altered condition of the nurse's milk, or the presence of some indigestible substance in the stomach. If the nurse have been under the influence of any violent emotion of the mind, or if she have begun to be out of order, or even to have the feelings preceding that event, it may be concluded that there is some morbid change in the milk. During the progress of teething, the increased quantity of saliva, together with its acrimony, proves occasionally the cause of sickness. In such cases the stomach may require the discharge of its contents by means of a gentle emetic: a little warm water or chamomile tea, or, at the most, some preparation of ipecacuan, will answer this purpose. Antimonials, in doses which excite vomiting, are frequently injurious to infants, and sometimes actually sink, with great rapidity, the living powers. When the vomiting is kept up by irritability of the stomach, which is sometimes the consequence of its actions having been disturbed by a cause already removed, slight cordials and aromatics may be given to strengthen the organ and abate its sensibility, and if these fail, some stimulant or anodyne may be applied externally.

It must be observed, however, that habitual vomiting from over-distention of the stomach, to which many infants are liable, may lay the foundation for future weakness of the digestive organs, and should therefore be guarded against by every precaution. For this reason, infants ought not to be allowed to suck too much at a time, and large quantities of spoon-meat should never be given in the early months.

Diarrhœa or Looseness—The natural appearance of the stools of infants should be familiar to every practitioner. In general the colour is that of a bright orange, the consistence is pulpy and curdled, and the smell is not offensive. Any deviation in these respects marks some diseased state of the stomach or bowels. During infancy, from two to four evacuations, within the twenty-four hours, seem necessary and useful; and even where that number is exceeded, it is not to be regarded as injurious, unless the health be impaired, or the flesh be rendered flabby. The appearance of the stools, in cases of diarrhœa, is very various. When they are green, and at the same time emit a sour smell, which arises from the

prevalence of acidity in the first passages; there is generally griping and fretfulness, but the complaint is not dangerous. It generally yields to a laxative, or, in very young infants, to a medicine composed of a little magnesia and rhubarb, with a little distilled water of dill or penny-royal, with a few drops of ammoniacal spirit, or of the compound tincture of camphor. The nurse's food should be regulated in this case, and the infant ought to have no other food, in addition to the milk, than arrow-root.

Slimy stools are generally the effect of exposure to cold, though they occasionally arise from some irritation or accumulation in the bowels. In both cases they are apt to be slightly streaked with blood. If there be violent pain, or symptoms of fever, intusussception is to be dreaded. A dose of cold-drawn castor oil, together with the warm-bath, or fomentation of the belly with flannels wrung out of hot water, are commonly all that are necessary, if the disease be attended to at the beginning. Where slimy stools are of the colour of clay, and emit a putrid smell, the infant soon becomes emaciated, and the disease often terminates fatally, though its progress be slow. Alteratives, with opiate frictions and occasional purgatives, afford the chief means of relief. If the infant be still at the breast, the milk should be changed, a practice which ought to be adopted in every instance where there is great tendency to looseness.

The most distressing cases of diarrhœa are those in which the stools are liquid, brown, black, or clay-coloured, and of an offensive smell. As the disorder proceeds, very unfavourable symptoms occur, such as emaciation and dryness of the skin, swelling or shrinking of the belly, with an altered appearance of the countenance; and there is a constant fretting or peevishness of temper. Swellings of the glands of the groin, and a little uneasiness of breathing, as if there were a slight tendency to cough, are also very unfavourable symptoms. In many of these cases the purging is the effect of a diseased state of some of the digestive organs, or of the mesenteric glands; but in others it arises from an irregular action of the former organs. In these disorders some practitioners begin the treatment by the use of emetics; but the advantages of these medicines are not very obvious, while the disadvantages resulting from their debilitating and irritating qualities in the stomach are sometimes unequivocal. On the whole, the continued use of alterative medicines, which maintained a steady but gentle action upon the alimentary canal and the adjoining viscera, seems to be the most successful treatment in these complaints; the physician, at the same time, correcting and modifying their operation according to circumstances, and palliating urgent symptoms. Part of the diet, in these cases, should consist of weak beef tea or chicken broth, with rice, or boiled cow's milk with baked flour, or arrow-root. The occasional use of injections of thin starch and laudanum, in the proportion of eight or ten drops of the latter to two table-spoonfuls of the former, may be employed to moderate the discharge when the strength is much reduced.

Of the severe and often fatal species of diarrhœa, just alluded to, there is one form which is known in Scotland by the name of the "*weaning brash*," and which has been well described by Dr. Cheyne. (*Essays on the Diseases of Children*. Ess. ii.) It occurs after weaning a child too suddenly, especially at an unfavourable season, as the autumn. It commences, sometimes two or three days after weaning, but frequently not for three or four weeks, with a purging and griping, and green stools. This, being erroneously ascribed to teething, is perhaps neglected, and the symptoms increase, a retching and vomiting supervene, and are gradually followed by a loathing of every kind of food, emaciation

emaciation and softness of the flesh, restlessness, thirst, and fever of a hectic character. But the most characteristic symptom of this disease is a constant peevishness, the effect of unceasing griping pain, expressed by the whine of the child, but especially by the settled discontent of its features. In the progress of the disease, the evacuations from the belly shew very different actions of the intestines, and great changes in the biliary secretion; for they are sometimes of a natural colour, at other times slimy and ash-coloured, and sometimes lienteric. The disease seldom proves fatal before the sixth or seventh week; but sometimes an earlier termination is suddenly produced by incessant vomiting and purging, or by convulsions, from the extreme irritation in the bowels.

By dissection Dr. Cheyne ascertained the state of the viscera in children who had died of this disease. In every case the intestinal canal, from the stomach downward, abounded with singular contractions, and had in its course one or more intussusceptions; the liver was exceedingly firm, larger than natural, and of a bright red colour; and the gall-bladder, which was enlarged, contained a dark-green bile. In some dissections the mesenteric glands were found swelled and inflamed; in others, however, they were scarcely enlarged, and had no appearance of inflammation. It is probable, therefore, that this disease is owing to an increased secretion of acrid bile, or rather to the morbid state of the liver which occasions this; and that the extremely irritable state of the whole abdominal viscera, marked by the spasmodic contractions and intussusceptions, &c. is occasioned by the presence and passage of this acrid excretion.

As the exciting cause of this *weaning brash* is apparently too sudden an alteration of the diet of a child at an unfit season, it follows that children ought at all times, but more particularly in the autumn, to be weaned gradually, and well accustomed to the food on which they are afterwards to subsist before they are finally taken from the breast. At the beginning of the disease, or even later, when the attack is slight, Dr. Cheyne recommends a dose or two of rhubarb, to the extent of five or six grains, at the interval of two days between each dose; and that, in the mean time, the child should take half or a third part of a grain of ipecacuan powder, mixed with six or eight grains of prepared chalk, and a small portion of some aromatic powder, as cassia, every four or five hours. A starch glyster, with five or six drops of laudanum in it, may be administered at bed time with advantage, if there be much griping along with the purging. The success of these remedies, however, will depend upon a strict attention to diet. An animal diet produces less irritation than one which is solely composed of vegetable matter. Eggs, the finer kind of light ship-biscuit, or arrow-root, custard, the juice of lean meat, plain animal jellies, broths freed from their oily part, and milk, are proper articles of nourishment. The breast milk might perhaps be restored with advantage. Vegetables of all sorts, particularly fruits, acids, and compositions of which sugar or butter form a part, and fermented liquors of every kind should be strictly prohibited. The feet should be kept warm by woollen stockings, and flannel worn next the skin; and the warm bath and fomentations may be frequently used to alleviate the continual spasms. Dr. Cheyne, however, taught by subsequent experience, recommends small doses of calomel as the most effectual remedy against the weaning brash, and other chronic forms of bilious diarrhoea. He generally gave half a grain of calomel, morning and evening, or a grain every night, for a week or ten days. After the third or fourth dose there is generally a

great change, he says, in the colour of the alvine discharge; it becomes of a dark mahogany colour, and is in general more offensive. When this change takes place it produces a favourable change in the disorder. Soon afterwards, the children become free from fever, more placid, and in a day or two more their appetite returns, with their former complexion, and every other demonstration of health. He never found, he adds, in the many cases in which he has given calomel, that it produced salivation, or any other unpleasant effect. Cheyne, Essay ii. On the Bowel Complaints more immediately connected with the Biliary Secretion.

Costiveness.—This opposite condition of the bowels, though seldom occurring in young infants, is productive, in children a little more advanced, of many distressing complaints. Some infants, indeed, seem to be habitually costive; and there is certainly a considerable variety, in respect to the state of the bowels, in different individuals. But what may be properly termed costiveness is never to be regarded as a natural deviation peculiar to any infant: it is always the effect of disease, or of the nurse's milk, or of the food. If one copious evacuation take place every twenty-four hours, and the infant be thriving, there is no occasion for interference; but if there be any greater torpor of the bowels than this, suitable remedies are to be employed. It is generally proper to treat the case at first as if it were the consequence of disease; and on this account a brisk laxative may be given every day, for four or five times successively. The best laxatives for infants are manna, calcined magnesia, calomel, and cold drawn castor-oil; and Dr. Hamilton recommends a laxative syrup, prepared with treacle and a strong infusion of senna.

Where these means fail, there is reason to attribute the costiveness to the nurse's milk. Sometimes that peculiar state of the milk may be altered by regulating the diet, and opening freely the bowels of the nurse. While proper means are tried for this purpose, the infant's bowels are to be kept clear by some mild laxative. But if it be found that the milk still possesses that injurious quality, the nurse should, if possible, be changed. Where this cannot be done, four or five drops of antimonial wine may be given to the infant every night at bed-time, and instead of the ordinary food, panada, made with small beer and treacle, should be substituted.

Temporary costiveness may be at any time removed by a suppository, made of a small piece of yellow soap, shaped like a very large Dutch writing-quill. This may be rendered more powerful, if necessary, by being dipped, previous to use, into some powdered sea-salt. Suppositories are more efficacious in infants, and much more easily managed than glysters, though these latter means are also sometimes useful. In cases of obstinate constipation, attended with symptoms of great oppression, aloes, suspended in treacle or syrup, is more powerful than any other laxative; from four to eight grains may be thus given for a dose. Many practitioners err, Dr. Hamilton affirms, by directing too small doses of laxative medicines for infants.

At a more advanced period of childhood, a morbid state of the alimentary canal, of which *costiveness* is a conspicuous symptom, frequently occurs, and is the source of several varieties of disease, both chronic and acute, which constitute perhaps the most frequent maladies of the puerile age. The first of these, to which we shall direct the attention of the reader, has been called, by Dr. Hamilton, senior, physician to the Royal Infirmary at Edinburgh, *marasmus*. See his *Observations on Purgative Medicines*, chap. iii. edit. 2d.

Marasmus includes a variety of symptoms which affect children of both sexes. The disease steals on gradually, and the following are the early symptoms by which it is characterized: a sluggishness, and lassitude on slight exertion, depravity and loss of appetite, a flabbiness and wasting of the muscular flesh, fulness of the features, and paleness or paly colour of the countenance, swelling of the upper lip, a constant itching of the nose, fœtid breath, with a swelling of the belly, an irregular and generally costive state of the bowels, and a change in the colour and odour of the fæces. When these symptoms have continued for some time other more urgent complaints ensue. There is an alternate paleness and flushing of the countenance, followed by heat and dryness of the skin, feeble and quick pulse, thirst, great fretfulness, increasing debility, and disturbed sleep, during which the little patients grind or gnash their teeth, and are subject to involuntary starting, and twitching of the different muscles, and, when awake, to a constant picking of the nostrils or lips, or even of the eyes, and to involuntary gelliculations, approaching to convulsions.

Every case of *marasmus* does not necessarily include all these symptoms; for they occur in different combinations. The disease appears most commonly among weak and infirm children, whether they are so from delicacy of constitution, or from incidental causes. It is particularly prevalent in large and populous cities, where children are deprived of ready access to exercise in pure air, and sicken and pine in the nursery; or when they are confined in crowded and airless school-rooms, whither they are sent, partly for the purposes of education, and partly, to use a common phrase, with the view of being kept out of harm's way. Children also, who are employed in manufactories, where their occupation and confinement are such as to weaken and enervate them, are liable to be attacked with this disease. Irregularity in diet and improper food also give rise to *marasmus*. It is accordingly observed to prevail most in the summer and autumn, the seasons which afford an opportunity of eating unripe fruit and vegetable articles from the garden.

Marasmus has generally been attributed to the presence of worms in the alimentary canal. But the *ascarides*, which are often passed in great numbers by children, are not accompanied, except incidentally, by the symptoms of *marasmus*; and the *tania*, or tape-worm, is altogether unknown in infancy and childhood. The *lumbicus*, or round worm, must therefore be the generally supposed cause of the symptoms of *marasmus*. But the disease occurs, in numerous instances, and is cured, when no worms are seen; and, on the other hand, the presence of *lumbici* in the bowels is by no means an uniform cause of bad health, and has been frequently noticed when *marasmus* did not occur. Various anthelmintic medicines, however, have been successively in vogue for the cure of the disease, upon the supposition of the existence of worms; but the utility of such of them as have been found to be most beneficial, Dr. Hamilton believes to have been in proportion to the purgative powers which they possessed. He says, "when I consider the languor and lassitude which precede this *marasmus*; when I recollect the constitutional or acquired debility of those who are more particularly exposed to be affected by it; instead of adopting the common opinion of its being occasioned by worms, I am more disposed to think, that a torpid state, or weakened action of the alimentary canal, is the immediate cause of the disease; whence proceed costiveness, distention of the bowels, and a peculiar irritation, the consequence of remora of the fæces. I have accordingly been long in the habit of employing

purgative medicines for the cure of this *marasmus*; the object is to remove indurated and fœtid fæces, the accumulation perhaps of months; and as this object is accomplishing, the gradual return of appetite and vigour mark the progress of recovery." *Obf. on Purg. Med.* p. 51.

Since the practical conclusions are the same, it is not of material importance by what theoretical views they are supported; but we accord with the following observations of Dr. Hamilton, junior, (professor of midwifery at Edinburgh, whose excellent "Hints for the Treatment of the principal Diseases of Infants, &c." we have before quoted.) "There can be little doubt," he says, "that neither the mere accumulation of the stools, nor the torpor of the bowels, on which that appears to depend, can explain the various symptoms produced by this condition of the digestive organs. There is every reason to suppose that there is an altered action, not only in the stomach and intestines, but also in the liver and lacteals, perhaps in all the parts concerned in the digestion of the food. When this has continued for a certain time, the accumulation of acrid matter, which is the consequence, adds greatly to the irritation, and while all this is going on, the circulating juices become depraved." *Hints, &c.* p. 113.

In the treatment of *marasmus*, then, the leading objects are, to remove the accumulating mass of morbid and irritating fæces from the bowels, to alter the morbid actions of the digestive organs, and to palliate the distressing symptoms which occur. The two first, which are the curative indications, are both fulfilled by a steady and persevering administration of purgative medicines.

In the incipient stage, while the disease is mild, the bowels are not altogether torpid and inactive, neither are they overloaded with accumulated fæces. Mild purgatives, therefore, repeated at proper intervals, effect a cure. They preserve the bowels in proper action, carry off fæces which had begun to be offensive and hurtful, and prevent farther accumulation. The disease yields in a few days to this treatment, and all that is farther required is some tonic medicine, which shall strengthen the stomach and bowels, together with a due regulation of diet, and occasionally a purgative at bed-time, the patient being likewise much in the open air. Preparations of iron are found the best tonics in these cases; and children readily take the wine of iron, or the filings covered with sugar. In selecting the purgatives, it is necessary to flatter the taste of our young patients. Powder of jalap is not altogether unpleasant: the mild neutral salts, dissolved in a suitable quantity of beef tea, are also convenient purgatives: but calomel will prove, on several accounts, the most certain and useful remedy of this kind.

When the confirmed stage of *marasmus* has been allowed to arrive, manifest danger threatens the young sufferer, whose remaining flesh and strength are rapidly wasted by the supervening fever; while prostration and depravity of appetite withhold necessary nourishment, and at the same time the more inactive state of the bowels, and greater bulk of feculent matter, throw additional difficulties in the way of a cure. Under these circumstances, an active practice should be adopted, with the view of stimulating the intestines, and of putting the collected mass in motion without delay. These ends are best obtained by giving small doses of the purgative medicine, and by repeating these frequently, so that the latter doses may support the effects of the preceding ones. When the bowels are once opened, stronger purgatives, given at longer intervals, will accomplish the cure.

While the purgative medicines are thus exhibited, it is absolutely

absolutely necessary, in order to have full information of their effects, to inspect daily what is passed by stool. The smell and appearance of the fæces are a criterion of the progress that is made in the cure, and direct the farther administration of the purgatives. This inspection is the more necessary, as we cannot expect the information we want from our little patients, and we shall often look for it in vain from the attendants, whose prejudices, and whose ignorance of our views, prevent them from seeing the propriety of the inquiry. During the prevalence of this disease, the fæces are dark, fætid, and varying from a colic consistence to that of clay, and are often fluid; and such they appear upon the first exhibition of the purgative medicines. It may be observed, that the recovery of the sick keeps pace with the return of fæces of a natural colour, form, and smell,—a change which the repetition of purgatives does not fail to produce.

While the purgatives are given in this manner, in the confirmed state of marasmus, in which the obstinacy of the disease is sometimes great, and the danger attending it imminent, nourishing food, of light and digestible quality, and suited to the taste of the patient, and the moderate use of wine, are much required. For some time after the symptoms have disappeared, it is expedient to continue a mild stimulus to the bowels. As they have recently suffered, and have been weakened by over-distention, they are apt to favour subsequent accumulation of fæces, the forerunner of a relapse, which is to be dreaded the more, as the patients have been weakened by the previous disease. And so far from being attended with any danger, this gentle solicitation of the alvine discharge, (for it ought to be gentle,) is the greatest promoter of recovery. (Hamilton's Obs. on Purg.) At the close of the disease, strengthening medicines, such as chalybeates, and the infusions of bitter vegetables, may be employed with some advantage to complete the cure.

As *marasmus* proceeds from symptoms of slight indisposition, which are easily obviated by proper stimulus and evacuation of the bowels, through a series of others which become daily more and more obstinate and dangerous, the health of children should be watched with great assiduity. Prostration and depravity of appetite, a changing complexion, tumefaction of the abdomen, scanty and unnatural stools, and fætid breath, indicate approaching danger. When these, therefore, are observed, the assistance of medicine should be resorted to, by the prompt use of which much eventual distress, and even death itself, may be prevented. But other considerations call for this assiduity. *Marasmus* has a close connection with some other formidable diseases, and either precedes or seems to accompany them; of these we may notice more particularly two, *hydrocephalus* and *epilepsy*.

Of the *HYDROCEPHALUS internus*, the bane of infancy and of childhood, we have given an ample account under its proper head. The pathology of the disease has been the subject of much variety of opinion, and is still involved in some obscurity. Thus much, however, is known, that it often steals slowly on, with symptoms resembling those of incipient marasmus; and that where it has been believed to exist, from the presence of some of its most characteristic symptoms, a diligent exhibition of purgative medicines has succeeded in restoring health. Too much attention, therefore, cannot be paid, to prevent the confirmed state of marasmus. See *HYDROCEPHALUS*.

Epilepsy, which is a disease most distressing to the patient, and perplexing to the physician, also often appears in childhood. It is confirmed by the repetition of the fits, till their

frequency and the force of habit fix it, and make it a constitutional disease for life. Now it is generally understood, that the first attacks of epilepsy are not always idiopathic, but are frequently the effect of particular irritation of the body or mind. There are numerous instances, indeed, of irritation of the body inducing epilepsy; and, in children, when no other is evident, the loaded intestine, and the morbid change induced in its contents, in the course of the marasmus above described, may be suspected of giving the irritation in question. In fact, worms in the intestines (or *marasmus*, for we may thus interpret the language of medical writers) have been mentioned among the causes of epilepsy. Surely, therefore, this consideration suggests another cogent reason for watching the rise and progress of marasmus: and it will induce us, on the first attack of epilepsy in children, arising from an uncertain cause, to set on foot a decided and active course of purgative medicines: and not to incur the risk of allowing the disease to strike root, while we are idly employed in the exhibition of inert and useless vermifuge medicines; or are groping in the dark in quest of other causes of the disease, or of uncertain remedies for their removal.

Colic pains are not uncommon in infants at the breast; for the delicacy of the bowels renders them liable to be affected by the most apparently trifling causes. Hence exposure to cold, inattention to changing the clothes when they become wet, too great a quantity of spoon-meat, some fault in the milk, too large doses of magnesia, and a collection of acid slime, or of air in the stomach and bowels, may severally be productive of this complaint. If an infant be fretful by fits, or at intervals, if its upper lip look blueish or livid, if it writhe or contort its body, and draw up its limbs towards the stomach, and more especially if it occasionally pass wind, which seems to afford relief, there is good reason to suppose it affected with *colic*. The lesser degrees of this complaint are of temporary duration, and so well understood, that a medical practitioner is seldom consulted on the subject. But the more violent degrees assume an appearance, which seldom fails to occasion much anxiety and alarm. Excessive and long continued shrieking, great fever, indicated by the heat of the skin and flushing of the face, oppressed breathing during the intervals of the screaming, and the evidence of pain being occasioned by the slightest pressure on the belly, are the ordinary symptoms in such cases.

With respect to one of the causes of colic above-mentioned, the exhibition of too much magnesia, it may be observed, that many women, from the best motives, but the most improper views, torment their infants with the frequent administration of this drug: because it has little taste, they naturally imagine that it can do no injury. But its operation depends on its undergoing a change, by combination with acids, in the stomach and bowels, which gives it the same properties as the laxative salts; and it is obvious, if too large a dose of these occasion colic pains in grown persons, the magnesia must, when given in too great quantity, or when there is much predominant acid in the first passages, produce the same effects in infants. Too much sugar, put into the meat of children, tends to generate much acid; whence it gives occasion to these pains, as well as to the green colour and sour smell of the stools, the green colour being occasioned by the mixture of an acid with the bile.

In slight degrees of colic, a few drops of Dalby's carminative, mixed with sugar and water, and a dose of cold drawn castor-oil, if the bowels be confined, are all that are necessary. The too common practice of giving spirits and
water

water to infants cannot be reprobated in terms sufficiently strong. Professor Hamilton asserts, from his personal knowledge, that many infants are annually destroyed in Edinburgh by this most unnatural practice; and we have too much evidence that the same practice is constantly resorted to by nurses on this side the Tweed. The best mode of preventing slight degrees of colic, is to take care that the infant do not suck too much at a time; to promote the discharge of any air that may be swallowed while sucking, by gently tossing the child now and then before his stomach be filled; to proportion the quantity of spoon-meat to the powers of his digestion; and to regulate the diet of the nurse, as it is now well known, that after certain articles of food, (such as particular kinds of malt-liquor and of vegetables,) a great deal more air than usual is separated during digestion from the milk.

In the more violent degrees of colic, the treatment must be varied according to the circumstances of the individual case. If it seem to arise from the accumulation of slime, or from some fault in the milk, suitable doses of cold drawn castor-oil, or magnesia and rhubarb, together with the warm-bath, or fomentations of the belly, are to be employed. But if the bowels be quite open, and the complaint have been evidently excited by exposure to cold, or some external circumstances; along with the warm-bath or fomentations, opiates, in the form of anodyne balsam, rubbed on the belly, may be safely prescribed. Preparations of opium should almost never be given internally to infants, as they may do, and have done, irreparable mischief. Dr. Hamilton recommends the tincture of *hyoscyamus* as a substitute. When constipation attends colic, the most active means of opening the bowels are to be resorted to. For this purpose even large doses of calomel, followed by cold drawn castor-oil and laxative glysters, are sometimes insufficient, and more powerful purgatives must be devised.

Introsusception, or intus-susception, is a very dangerous disease, which resembles colic so much, that it sometimes requires great practical discernment to draw the line of distinction between the two diseases. This disorder consists of the passage or inversion of one portion of the intestines into another, together with a stricture and consequent inflammation in the introsuscepted portion. Sometimes these are such as to close the canal; but in other cases, the passage through the gut, though narrowed, remains free. *Introsusception* is occasioned by violent irritation and spasmodic action of a part of the gut, and this may be excited by worms, by morbid fæces, or undigested aliment, by drastic purgatives, &c.; whence it is sometimes the consequence of colic.

If, along with the ordinary symptoms of very violent colic, the pulse be unnaturally slow, or if there be urgent calls to void the stools, and nothing but slime, or slime tinged with blood be passed, there is much reason to dread the existence of this disease.

When *introsusception* is discovered at the beginning, it often yields to the use of leeches, warm fomentations, and a medicine calculated to excite both vomiting and purging. But if its nature be overlooked or misunderstood, even for a few hours, the fatal event can hardly be prevented. A discharge of blood from the bowels, but more often stupor and occasional convulsions, precede death. Hamilton's "Hints." See also the surgical article *INTRO-, or INTUS-SUSCEPTION*.

Prolapsus ani, or falling down of the gut, that is, a partial eversion of the *rectum*, or straight gut, through the fundament, is a common effect of bowel-complaints in weakly children; and seems to consist of a relaxation of the gut, which is forced downwards by any irritation that excites constant or frequent efforts to expel fæces, followed by some

degree of spasmodic stricture in the *sphincter* muscle, which prevents it from returning. It is generally of temporary duration only, and is easily replaced by slight pressure. Nurses commonly apply a piece of woollen cloth or a napkin for this purpose, but, Dr. Hamilton says, a better plan is to lay the child upon his face, to separate his thighs, and then to press together both his buttocks. If those means fail, it becomes necessary to introduce the fore-finger, previously greased, into the gut, to remove the stricture from the sphincter. This is a more safe and speedy method than the application of astringent substances to the protruded parts, which might irritate or inflame them. With the view of preventing the frequent recurrence of this most unpleasant, though not dangerous complaint, all irritations of the bowels ought to be guarded against; the *nates* should be dipped twice a day into a tubful of cold water, in which a red-hot iron had been frequently quenched, and the child ought to be made to sit regularly on a firm hard seat. In some instances the relaxation of the parts becomes so great, that the gut descends every time the child goes to stool. In this case, astringent lotions, applied by means of a compress of soft tow, have been resorted to with success; or suppositories of various substances have been introduced into the bowel after going to stool, giving a mechanical support to the parts.

Worms in the intestines, although commonly supposed to be the cause of all the varieties of *marasmus*, are much less frequent causes of disease in children, as we have above stated, than other morbid changes in the digestive organs. None of the three varieties of intestinal worms, however, are peculiar to children; and the *tenia*, or *tape-worm*, is seldom, if ever, found in infants. Of the *ascarides*, or small thread-worms, as they have been called, a full account has already been given; and a description of the *lumbicus*, or round-worm, will be found under its proper head. For the symptoms of worms, as they are commonly related, see the foregoing history of *Marasmus*.

§ 5. *Febrile Diseases*.—Infants and children are liable to most of the fevers which affect adults, both contagious and non-contagious; although within the first eight or ten months they are not so susceptible of the influence of contagion, as they afterward become. A sucking child will sometimes escape the infection of scarlet-fever, measles, and even the small-pox, which seizes the rest of a young family. Each of the diseases just mentioned, as well as the whooping-cough, chicken-pox, and catarrhal fevers, which are among the disorders, which children seldom escape, are sufficiently important for separate consideration respectively. (See *FEVER, Scarlet, MEASLES, SMALL-POX, PERTUSSIS, VARICELLA, and CROUP*; also *COW-POCK*.) Our attention, in this place, will be chiefly confined to a form of fever, which is in some measure peculiar to infants, and is now generally known by the name of "infantile remittent fever."

The *infantile remittent fever*, or *febris infantum remittens*, as it was first denominated by Dr. Butler, might perhaps have been included without impropriety under the foregoing section, among the disorders originating in the bowels; for it is now pretty generally understood, that this fever is connected with a morbid state of the excretions in that canal. As the *marasmus*, above described, has been commonly attributed to the presence of worms in the intestines; so this fever has been ascribed to the same cause, and has been called the *worm-fever*; partly, it would seem, from the occasional discharge of worms during the course of the fever, and partly from the sameness of the symptoms of irritation in the bowels, from whatever cause it may arise. This fever was called *Helica febris infantum* by Sydenham, and *Helica infantilis* by Sauvages, from the slow and moderate progress which it com-

monly makes ; and for the same reason, Hoffman gave it the appellation of *Febris lenta infantum*.

The fever in question is most commonly preceded for some days, and occasionally for weeks, by symptoms of indispotion, much resembling the early symptoms of *marasmus*. The child is observed not to look well, and his colour often changes. He is indolent, spiritless, and fretful ; frequently picks his nose, lips, and fingers, even sometimes till he draws blood : his breath is offensive, and he is affected with a short dry cough. If he can speak, he complains of pain in his head, or belly, or both : and when still older, he says also that he is faint and weak. He has a desire for drink more than for food ; is much troubled with wind ; and his belly is sometimes larger than natural. In his sleep, he starts, moans, and makes a grating noise with his teeth. His urine puts on a milky appearance almost as soon as made, and, in a few minutes, deposits a sediment of the same colour, leaving the body of the urine with very little colour. His bowels are generally in the extreme, being either costive or loose.

After these symptoms have continued for a longer or shorter time, the fever makes its appearance, sometimes preceded by a distinct cold fit, at other times, however, so gradual in its approach, that the commencement is not observed. It always assumes more or less of the remittent form, when it is distinctly seen, and the exacerbations are long, and the remissions short, in proportion to the violence of the fever. During the exacerbation all the symptoms are increased ; there is great heat of skin, and the patient is drowsy, and sleeps, but not soundly ; for he starts, moans, talks incoherently, and even screams in his sleeps. The wind is particularly troublesome, makes a rumbling noise in the bowels, and is exploded copiously both upwards and downwards, with manifest relief. The cough is more frequent, and the breathing is quickened and oppressed. The patient is often sick, and sometimes retches, and even vomits phlegmy stuff of various colours. The pulse beats from a hundred and forty to a hundred and sixty pulsations in the minute. In the remissions, all the symptoms abate. The patient is wakeful, is attentive to things around him, often inclines to be playful, and is in general averse to lying in bed. What sleep he has is usually composed. The pulse beats from a hundred and twenty to a hundred and thirty strokes in a minute.

These exacerbations and remissions often occur with a considerable degree of regularity ; the exacerbation generally beginning in the evening, and the remission taking place in the morning : but in the more acute form of the disease, there are one or two shorter exacerbations during the day. In the latter case, both in the exacerbations and remissions the skin is commonly dry : when sweats happen, they are partial, affecting only the head, breast, or palms. The belly and palms are always warmer than any other part of the body. Where there is only the nocturnal exacerbation, it is usually terminated by a profuse sweat ; and through the day, the skin is temperate, but feels dry and harsh. The patient has no appetite, and scarcely any thirst ; so that in many cases, it is with great difficulty that he can be made to take either food or drink. The state of the bowels is uncertain ; but the stools are always unnatural, either as to their colour, consistence, contents, or smell : most commonly they are morbid in all these respects ; for they are either whiter or darker than natural ; they are always more offensive ; are seldom without a great deal of slime, and sometimes consist of nothing but slime : sometimes they froth and ferment like yeast.

The patients frequently pass worms in the course of this fever, even when they were never known to void any before. These worms are not only thrown off by vomiting and stool, but are sometimes observed to work themselves out of the body both ways, seemingly unafflicted by any exertions on the part of the patient's organs. But in many cases of this fever, no worms are ever seen.

When the fever is on the decline, the exacerbations grow milder and shorter, and at length disappear one after another ; the appetite returns by degrees ; the sleep becomes calm and refreshing, attended with a general moisture of the skin, and the stools approach more and more to the natural state, till they become as in health. The duration of this fever, in its more acute form, is from eight or ten days to a fortnight or three weeks ; in the more slow and mild form, it will last for two or three months or more.

That the cause of this remittent fever of children lies in the alimentary canal, and is of the same nature with that from which *marasmus*, and several other infantile diseases originate, has not been doubted since it was so well pointed out by Dr. Butter. It is proved, in the first place, by the similarity of the symptoms with which it is preceded and ushered in, and, secondly, by the nature of the alvine discharges during its continuance, but more especially by the success of the practice, which is founded upon this principle, and consists in carrying off the accumulation of morbid excretions from the bowels, and augmenting their strength. The same cause operating in different constitutions, will produce a different series of symptoms ; and it is probably from the peculiar irritability of habit in some children, that this fever is produced, by the same morbid secretion and accumulation in the *primæ viæ*, which give rise to *marasmus*, and other chronic maladies in others. "It may be accelerated by cold, fatigue, or the like ;" says Dr. Butter, (speaking of the remittent fever,) "but the principal causes are crude accumulations in the first passages, which, with a very irritable predisposition, draw the intestinal canal into spasm, &c." whence the irritation is communicated to the rest of the body, and general fever induced.

Cure of the infantile remittent fever.—The two principal indications of cure are, to allay the febrile irritation, and to remove the great irritating cause ; the former of which, although in a great measure palliative only, is an object of considerable importance. It is extremely desirable, therefore, that from the first occurrence of the febrile symptoms, the child should be kept still, and quiet, in a chamber which is of a cool temperature ; that all solid food and stimulating drink should be cautiously abstained from ; and the sole support of the patient be diluting and nourishing liquors, such as small broth, gruel, and barley-water.

The second, or proper curative indication, is fulfilled by such medicines as keep up a constant gentle action upon the bowels, and contribute at once to dislodge the morbid accumulation, and to correct the morbid condition, of the alvine excretions. This purpose may be effected either by the neutral salts, or by small doses of mercurial laxatives, especially in combination with absorbents. Dr. Butter gives the preference to the former ; and commonly employs the *polybreft salt*, which promotes both urine and stools. For a child of five years old (and proportionally for a younger or older subject) he dissolves a drachm of this salt in a quarter of a pint of water, sweetening it with two drachms of sugar. Of this mixture two spoonfuls are administered every four hours, or at such intervals, when the child is awake, that the whole may be finished in twenty-four hours. This medicine is to be repeated daily, so as to promote one, two, three,

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three, or four stools, according to the circumstances of the case, the larger number in the more acute forms of the disease. When the fever is attended with a looseness, Dr. Butler interdicts the use of the neutral salts, and prescribes the extract of hemlock (*Conium*, Linn.); the quantity of five grains to be taken in the course of 24 hours, suspended in water with a little sugar. It relieves every symptom of the fever, he says, and at the same time gradually carries off the looseness. Under similar circumstances, we have seen essential service from small doses of some mercurial, combined with absorbents, as the *Hydrargyrus cum Creta*, of the London Pharmacopœia; or a grain of calomel united, by rubbing, with a little soda and testaceous powder. While the *conium* is given as above-mentioned, as much rhubarb may be administered as will keep the body gently open, where the fever is not very acute.

When there is great restlessness and vociferation, the belly should be fomented with flannel cloths, wrung out of a decoction of chamomile, and applied agreeably warm, for twenty minutes or half an hour at a time, as occasion may require; and this operation should be repeated as often as the symptoms return. As the disease declines, the child may be allowed to return gradually to his usual diet and way of life; but some care will be requisite, that he may not have his free liberty as to eating, drinking, and exercise, until he has recovered his full flesh and strength; and the medicines above recommended must be continued till the fever is quite gone.

Catarrhal fever is not a very frequent disease during infancy, and when it does occur, seldom requires any other treatment, than an emetic at the beginning, an open state of the bowels, and the warm bath every night while it continues. When it extends to the degree of pulmonary inflammation, blistering the chest is often an effectual remedy, or, in strong children, the application of leeches to the chest may be resorted to. The principle of treatment, indeed, is the same in these complaints, whether they occur in the early or later periods of life; except that the infantile constitution is more easily acted upon by remedies, and therefore that a laxative and a blister will often accomplish a degree of alleviation of fever, which more active measures will be required to produce in adults. See CATARRH and PERIPNEUMONY.

Among the fevers incident to children, the *acute hydrocephalus*, or water in the head, should be described; but we have already given the history of that important disease in its place. (See HYDROCEPHALUS.) It remains for us to say a few words on the subject of convulsions.

§ 6. *Convulsive Diseases*.—The subject of convulsions, in general, has been treated under its proper head, (see CONVULSIONS,) as well as the most severe modifications of convulsive disease, the epilepsy and St. Vitus's dance. (See EPILEPSY and CHOREA.) It will, therefore, be sufficient to state here some circumstances relative to the convulsions of infants in particular. And first it must be observed, that, in consequence of the peculiar susceptibility of impression in the nervous system of infants, many circumstances excite convulsions at that early age, which have no such effect at a subsequent period of life. Accordingly it is well known, that in general the younger the infant is, the more readily do fits occur, and that some families are more liable than others to the disease, apparently from a weak state of the nervous or vascular system being communicated from the parents. The obvious exciting causes are dentition, mechanical injuries, acute diseases, impurities of the air, passions of the mind, indigestible or poisonous substances in the stomach or bowels, over-distention of those organs, irritations in them from acrid matter or worms, the state of the system previous

to the appearance of small-pox, measles, &c. All these act by disturbing the nervous system, and altering or deranging the actions of the vessels.

In some cases convulsions come on suddenly; the infant, from being in the most perfect health, turns in a moment livid, his eyes and features are contorted, and his limbs and whole frame are thrown into violent agitations. These symptoms are succeeded by a suspension of the vital powers, as in faintings, which may or may not prove fatal. Sometimes the attack is gradual, and the first symptoms are not easily discerned by the attendants: the infant shews some degree of uneasiness; he changes colour, his lips quiver, his eyes are turned upwards, and he unexpectedly, as it were, stretches himself out, or his hands become clenched. The lesser degrees of these are called by the nurses *inward fits*. Convulsions commonly precede the fatal termination of most of the diseases of infancy, which explains the reason of their appearing in the bills of mortality to be of such frequent occurrence. Accordingly, where they take place after any considerable indisposition, they are to be regarded as the harbingers of death. But even where the infant had been in perfect health previous to the attack, the event is always to be considered as extremely uncertain, for a single fit may kill. In ordinary cases, the danger is to be estimated by the degree of violence of the fit, and by the cause which had produced it. Thus if the cause be some irritation, which is naturally of temporary duration, or which can be easily removed, a favourable event may be looked for; but if it be not obvious, it may be suspected to be some state of the brain, which admits of no remedy. In many instances, where it was impossible to discover the cause of the fits during life, an accumulation of water within the ventricles of the brain has been found after death.

There is no medicine possessed of any specific power in suppressing convulsions, although cochineal, musk, and other substances, have been at different times extolled for supposed virtues of this nature. One of the most effectual means of alleviating the fits, is to immerse the child, during their attack, in a tubful of water, heated to 96° of Fahrenheit's thermometer, or to a warmth that the hand can easily bear. In very young infants opiates are not always safe, and cannot be trusted in the hands of nurses or inexperienced persons; but in children upwards of eighteen months, where the warm bath does not speedily succeed in abating the convulsions, from one or two to four or five drops of the tincture of opium might be administered, according to the severity of the fits: or a proportionate quantity of the camphorated tincture of opium, or of the extract of poppies diffused in a little water. Professor Hamilton has recommended a substitute for opium, which may be given to younger children; namely, the tincture of *hyoscyamus*: "twenty drops, evening and morning, have been repeatedly given to infants within six months of age." He remarks that, when the convulsions have been the effect of whooping-cough, great benefit has been derived from this medicine. Camphor, in the form of glyster, has seemed serviceable in some few cases, the same author states, but chiefly in children beyond the second year. He adds, "when a child seems to be suddenly deprived of life by one or two fits, if he appeared previously in good health, he ought on no account to be considered as irrecoverably lost; but the common means for restoring suspended animation should be carefully employed, as long as his colour is not entirely changed." Hints, &c.

Some other diseases, which occur in infancy and childhood, might here have been described; especially the glandular affections, both internal and external; the various disorders

of the scalp, as the scald-head, ring-worm of the scalp, &c. ; the rickets, and so forth. But some of these are not peculiar to the age of childhood, and others are sufficiently important to be discussed more at length. See *TABES mesenterica*, or mesenteric consumption; *SCROFULA*, *PORRIGO*, *RICKETS*.

The *prevention of diseases* in children depends principally on the regulation of the diet and clothing, sleep, exercise in the open air, and cleanliness. On the subject of the two or three last points we have little to say, as the value of a proper attention to them is now generally understood. In regard to diet, it may be sufficient to state, that, after weaning, preparations of milk, of eggs, of vegetable and animal jellies, should precede solid animal food; that, during childhood, a proper proportion of animal and vegetable matter should be used; and that all condiments, except salt, are unnecessary, and all spirituous fermented liquors pernicious. In respect to clothing, it is important to observe, that the attempts to rear children in a hardy manner, by allowing their legs to be bare, and other parts of the body to be much exposed (a practice sanctioned by some great names) have proved most unsuccessful; for by these means not only has the growth been, in many instances, stunted and perverted, but the constitution has been much injured, and, in some cases, life absolutely destroyed, in consequence of inflammations of the lungs and bowels, or various scrofulous affections, thus excited. It would appear, indeed, that scrofulous and consumptive diseases owe their origin principally to the cold and humidity of our climate, and the deleterious influence of these causes upon the constitution in childhood was strikingly illustrated in the attempt lately made by the Sierra Leone Company to form an establishment for the education of African children in this country. Mr. John Pearson, who superintended this institution, states that they all died of consumption: they almost uniformly became scrofulous; they bore the first winter tolerably well, but drooped during the second, and the third generally proved fatal to them; inasmuch that it became necessary to abandon the plan. Now we cannot but deem the situation of a child, who is to be hardened by thin clothing, as analogous to that of these African children, and to believe that, by such delusive attempts to give strength, the perfect and healthy evolution of the system is prevented, and the foundation laid for scrofula, consumption, and other chronic diseases.

INFANTS, Running Eyes of. See *OPHTHALMY*.

INFANTS at Bethlehem, Slaughter of, by Herod, a fact mentioned in the gospel of St. Matthew, chap. ii. 16.; but disputed on account of the silence of Josephus, who has written the history of the Jews, and particularly the reign of Herod. The fact is not in itself improbable nor incredible, if we consider the cruelty of Herod's disposition and other savage acts of which he was guilty (see *HEROD*), and more especially if we recollect, that the slaughter, mentioned by St. Matthew, was perpetrated upon the occasion of tidings brought to Jerusalem, of the birth of one who was "king of the Jews." Josephus, who has given an account of a terrible execution made in Herod's court, and at Jerusalem, about the same time, upon the occasion of some predictions, that God was about to take away the kingdom from Herod, might omit the murder of the infants at Bethlehem from a fear of being charged with a design to load Herod unreasonably, or a fear of rendering his history disagreeable by too particular a detail of cruel actions. The silence of Josephus, it is said, is no more an objection against St. Matthew, than the silence of other writers with regard to facts mentioned by Josephus is an objection against him. Josephus, however, if he was a firm Jew, as most writers

have supposed, had a particular reason for passing over this event at Bethlehem, because he could not have mentioned it, without giving great advantage to the Christian cause. If he had written that Herod, at the latter end of his reign, had put to death all the young children at Bethlehem, on occasion of a report spread at Jerusalem, that the "king of the Jews" had been newly born there, he would very much have gratified the Christians; since it was well known, when he wrote, that about thirty years after the death of Herod, Jesus, being then about thirty years of age, had been styled the "king of the Jews," and had been publicly crucified at Jerusalem with that title; and it was firmly believed by all his followers, that he was the great person spoken of under that character, and was now advanced to dominion and power. If Josephus did not wish to serve the Christians and their cause, he would therefore be silent with regard to this fact. But it has been alleged, that the Greek and Roman historians are silent with respect to this event: but this may easily be accounted for, if we consider, that the Roman empire was at this time so extensive, that the affairs of many dependent princes have been lost in the crowd. Nevertheless, St. Matthew's account is confirmed by the testimony of ancient Christian authors. Justin Martyr, Irenæus, Origen, and other Christian writers have mentioned the fact. Moreover, there is also a noted passage in Macrobius, a heathen author, who flourished in the latter end of the fourth century, who, among other jests of Augustus, has this: "When he (Augustus) had heard that among the children within two years of age, which Herod king of the Jews commanded to be slain in Syria, his own son had been killed, he said, 'it is better to be Herod's dog than his son.'" Macrob. Sat. l. ii. c. 4. This passage, if we deduce no other inference from it, shews, that Herod's slaughter of the infants in Judea was a thing well known in Macrobius's time, and was not contested by the heathens. See Lardner's Works, vol. i. chap. 2.

INFANTA, in *Geography*, a river of Africa, which runs into the Indian sea, S. lat. 32°.

INFANTE and *INFANTA*, are titles of honour given to the children of some princes; particularly those of the houses of Spain and Portugal.

It is usually said, that the appellation of *infanta* was introduced into Spain on occasion of the marriage of Eleanor of England with king Ferdinand of Castile: and that their son Sancho was the first that bore it. But this is contradicted by Pelagius, bishop of Oviedo, who lived in the year 1100, and who informs us, that the titles *infante* and *infanta* were used in Spain ever since the reign of king Evremond II.

INFANTICIDA, in *Mythology*, the name of a deity to whom, according to Lycophron, children were sacrificed by the Greeks. It is not likely that this was originally the name of any separate deity; but from the lamentable frequency of this almost incredible offering, this horrible distinction was appropriately applied to, most probably, Hecate, or some other form of the goddess Diana, of multifarious names and characters. The subject of infanticide has lately undergone more than usual discussion, and the prevalence of the practice, both heretofore and existing, proved of greater extent than could have been imagined. See the following article.

INFANTICIDE, or child murder, is an enormity that our reason and feelings would lead us to reckon as a crime of very rare occurrence. That it should exist at all is, at the first view, surprising,—that it should prevail to any extent is difficult of belief,—that parents should be its perpetrators is in a high degree painful to imagine; but that mothers should

should be the executioners of their own offspring, nay, their habitual and systematic executioners, is such an agonizing contemplation, such an outrage on humanity, as every amiable feeling of our nature sickens and revolts at. But that this lamentable custom is, notwithstanding, extensively prevalent, has lately been developed so demonstratively, that, however comfortable it may be to our wounded sensibility to indulge the hope of error, it is, unhappily, the wantonness of scepticism to doubt. To try, however, as it would seem, the sketch of our credulity, we are imperatively called upon to believe this unparalleled enormity of a race, heretofore supposed to be the most humane in existence; viz. of the Hindoos: but of that race, which is among the most tender in other respects, we are constrained to believe that by them this sad deed has been systematically and universally perpetrated!

A few years ago it was discovered by Mr. Duncan, then resident at Benares, that a sect of Hindoos in that neighbourhood, called Rāj-kūmār, was in the habit of destroying all their female infants. A notice of this extraordinary fact was soon after published in the fourth volume of the Asiatic Researches, by Sir John Shore (now Lord Teignmouth), then governor-general of India. Mr. Duncan succeeded in persuading this deluded tribe to relinquish their barbarous habit; and so effectually, that no instance has since been discovered of an infringement of the written penal obligation that the chiefs and other individuals of that tribe then voluntarily entered into. As well as the Rāj-kūmārs, other sects of Hindoos, in the vicinity of Benares, were found to have been in similar habits, though to a less extent, and they executed a similar deed of renunciation.

The same gentleman, the Hon. Mr. Duncan, now governor of Bombay, in the year 1800, being at Surat, heard incidentally that on the western side of India also, and especially in the contiguous countries of Guzerat, Kutch, and Sind, infanticide was extensively practised; due enquiry amply confirmed the fact. Availing himself of the recently improved connection between the British government and that of the Gaikwar, or sovereign of Guzerat, Mr. Duncan, through the able and zealous co-operation and agency of Colonel Walker of the Bombay establishment, our political resident and military commander in Guzerat, again succeeded in the entire and effectual abolition of the custom; all the chiefs of the tribes in which it had obtained binding themselves and their families, and adherents, to a permanent renunciation and discontinuance of it; rendering themselves, in default of a due observance of the agreement, obnoxious to penal inflictions on the part of the British and Gaikwar governments.

Among the military tribe of Jarejāh, infanticide was found most common; so common, indeed, that a Jarejāh female was very rarely seen or heard of. The men of this tribe procured wives from others who reared their daughters. The number of infants, thus sacrificed, amounted, by one computation, to 30,000 annually, in the peninsula of Guzerat alone: but this Colonel Walker deemed an exaggeration. Another estimate, erring probably on the other hand, reckoned 2000 as nearer the annual amount. It appeared to be the universal practice to destroy the infant immediately on its birth: this was done generally by the midwife, or some female attendant; sometimes, however, by the mother! The father never interfered, and the name or subject of a daughter was never mentioned in his presence. Sometimes the infants were smothered in various ways, or suffered to expire from want of nurture: different methods of destruction are related, and it seems to have been a matter of indifference how, provided the inhuman deed were done.

In the contiguous countries of Kutch and Sind, infanticide also prevails: but it has not been ascertained to what extent. It is recognized and avowed by the persons possessing the powers of government, who assert the antiquity of the usage, and forbid any interference on our part with a view to its abolition: our endeavours to effect that salutary end have in those quarters entirely failed.

It is, however, a consoling fact to reflect on, that solely through British interposition this custom has been put an entire stop to throughout the vast extent of our influence in India. None of the former governments, whether Hindoo or Mahometan, of the countries comprehended within that term, appear ever to have made any effort toward working so desirable a reform, although the religious tenets of both pointedly prohibit the practice.

These particulars we have gathered from a recent publication by Major Moor, on "Hindoo Infanticide;" wherein he has given at length all the correspondence and negotiations that led to its discovery and suppression in India; with notices of a similar custom, which, and the exposure of children, he proves to have prevailed both in ancient and modern times among many nations in almost every part of the world. He adduces many speculations on its existence, origin, and effects; extending, indeed, to a lengthened discussion on a subject that, as much as any on record, evinces the almost incredible inconsistency and weakness, and wickedness of man. See INFANTICIDE.

INFANTOS, in *Geography*, a town of Spain, in New Castile; 20 miles W. of Alcaraz.

INFANTRY, the body of foot soldiers, in an army, or other corps. See FOOT.

The infantry stand contradistinguished from the *cavalry*, or horse, which see.

Europe is unquestionably indebted to the Swiss for a total change in the military system, particularly so with regard to foot soldiers.

Dr. Robertson, in the first volume of his history of Charles V. p. 105, observes, that the system of employing the Swiss in the Italian wars, was the occasion of introducing a total innovation in the military custom. The arms and discipline of the Swiss were different from those of other European nations. During their long and violent struggles in defence of their liberties against the house of Austria, whose armies, like those of other considerable princes, consisted chiefly of heavy-armed cavalry, the Swiss found that their poverty, and the small number of gentlemen residing in their country, at that time barren and ill cultivated, put it out of their power to bring into the field any body of horse capable of facing the enemy. Necessity compelled them to place all their confidence in infantry; and in order to render it capable of withstanding the shock of cavalry, they gave the soldiers breast-plates and helmets, as defensive armour, together with long spears, halberds, and heavy swords, as weapons of offence. They formed them into large battalions, ranged in deep and close array, so that they could present on every side a formidable front to the enemy. (See Machiavel's Art of War, b. ii. chap. ii. p. 451.) The men at arms could make no impression on the solid strength of such a body. It repulsed the Austrians in all their attempts to conquer Switzerland. It broke the Burgundian Gendarmerie, which was scarcely inferior to that of France, either in number or reputation; and when first called to act in Italy, it bore down, by its irresistible force, every enemy that attempted to oppose it. These repeated proofs of the decisive effects of infantry, exhibited on such conspicuous occasions, restored that service to reputation, and gradually re-established the opinion which had been

been long exploded, of its superior importance in the operations of war. But the glory the Swifs had acquired, having inspired them with such high ideas of their own prowess and consequence, as frequently rendered them mutinous and insolent, the princes who employed them became weary of depending on the caprice of foreign mercenaries, and began to turn their attention towards the improvement of their national infantry.

The German powers having the command of men, whom nature has endowed with that steady courage and persevering strength which form them to be soldiers, soon modelled their troops in such a manner, that they vied with the Swifs both in discipline and valour.

The French monarchs, though more slowly, and with greater difficulty, accustomed the impetuous spirit of their people to subordination and discipline; and were at such pains to render their national infantry respectable, that as early as the reign of Louis XII. several gentlemen of high rank had so far abandoned their ancient ideas, as to condescend to enter into their service.

The Spaniards, whose situation made it difficult to employ any other than their national troops in the southern parts of Italy, which was the chief scene of their operations in that country, not only adopted the Swifs discipline, but improved upon it, by mingling a proper number of soldiers, armed with heavy muskets, in their battalions; and thus formed that famous body of infantry, which, during a century and a half, was the admiration and terror of all Europe. The Italian states gradually diminished the number of their cavalry, and in imitation of their more powerful neighbours, brought the strength of their armies to consist in foot soldiers. From this period, the nations of Europe have carried on war with forces more adapted to every species of service, more capable of acting in every country, and better fitted both for conquests, and for preserving them.

INFANTRY, *Exercise*. See EXERCISE.

INFANTRY, *Foreign*. The foreign infantry in the service of Great Britain, according to the returns delivered in on the 1st of November 1800, consists of Loyal French Emigrants, Castries, Mortemart, Roll and Dillon; Meuron ditto; four ditto Dutch, each having a company of artillery attached, and one Dutch rifle with a company of pioneers; Lowenstein's corps, which was not completed, and one corps of foreign invalids. Staff to a foreign hospital. There are besides 16 unattached foreign officers who receive full pay, 166 ditto on half pay, 504 aged and wounded ditto, 46 foreign officers widows, 44 children of foreign officers who have died in the king's service. There is also a small corps of estafettes, which is attached to the waggon train, and consists wholly of foreigners.

INFANTRY, *Heavy armed*, among the ancients, were such as wore a complete suit of armour, and engaged with broad shields and long spears. They were the flower and strength of the Grecian armies, and had the highest rank of military honour.

INFANTRY, *Light armed*, amongst the ancients, were designed for skirmishes, and for fighting at a distance. Their weapons were arrows, darts or slings.

INFANTRY, *Light*, have only been in use since the year 1656. They have no camp equipage to carry, and their arms and accoutrements are much lighter than the common infantry, or battalion men. Wherever there is light cavalry, there should be light infantry to act in conjunction.

INFARCTION, in *Medicine*, *infarctus*, ἐμφραξις; of the Greeks, is synonymous with *obstruction*, and *congestion*, and denotes that state of any organ of the body, which is tumid, with the blood-vessels loaded, and is more especially applied

to the tumours produced by a chronic inflammation of the parts.

INFARCTION of the *Liver*. See HEPATITIS, and LIVER, *Chronic Diseases of*.

INFARCTION of the *Spleen*. See SPLENITIS and SPLEEN.

INFARCTION of the *Mesentery*. See MARASMUS, and TABES Mesenterica.

INFATUATE, to prepossess any one in favour of some person or thing that does not deserve it, so far as that he cannot easily be disabused.

The word *infatuate* comes from the Latin *fatuus*, *fool*, of *furi*, to *speak out*; which is borrowed from the Greek φῶς, whence φῶς, which signifies the same with *vates* in Latin, or *prophet* in English: and the reason is, because their prophets or priests used to be seized with a kind of madness or folly when they began to make their predictions, or deliver oracles.

The Romans called those persons infatuated, *infatuati*, who fancied they had seen visions, or imagined the God Faunus, whom they called *Fatuus*, had appeared to them.

INFECTION, in *Medicine*, a word used in two acceptations: first as denoting the effluvium or infectious matter, exhaled from the person of one diseased, and capable of communicating the disease to others who inhale it; in which sense it is synonymous with *contagion*: and secondly, as signifying the act of communication of such morbid effluvium, by which the disease is transferred. The word comes from the Latin verb *inficio*, which properly signifies to dye of some other colour, or to cause something to be imbibed. See CONTAGION.

INFEOODATION of *Tithes*, in *Law*. See TITHES.

INFERIÆ, in *Antiquity*, sacrifices offered to the dii manes, or the souls of deceased heroes and illustrious persons; or even of any relation or person whose memory was held in veneration.

INFERIOR, stands opposed to superior.

INFERIOR Courts of *Record*, in *English Law-writers*, is used as a general name for corporation-courts, courts-leet, and sheriffs-torns. See COURTS.

Most courts are subordinate to some other; but for distinction sake the term inferior-court is by sir Matthew Hale, and others, applied in the manner here mentioned.

INFERIOR *Maxilla*, *Ocean*, *Planet*. See the substantives.

INFERIOR *Penis*, in *Anatomy*, a name given by Spigelius to one of the muscles of the penis, generally called the accelerator by the moderns; and by Vesalius, and others of his time, *primus penis*.

INFERIOR *Obliquus*, *Serratus*, *Subscapularis*. See the several articles.

INFERIORIS *labii depressor*, *labii elevator*. See DEPRESSOR, and ELEVATOR.

INFERNAL GLASS, in *Chemistry*, is a name given to the bolt-head, when its stem is continued downward into the body of the glass vessel, and left open only by a very small orifice.

INFERNAL Salt, a name given by Hoffman, and some other of the chemical writers, to nitre; they have also called it, *cerberus chemicus*.

INFERNAL Stone. See LAPIS Infernalis, CAUSTIC, and CRYSTALS of Silver.

INFERNALS, in *Artillery*, floating mines constructed in the bodies of ships or boats. The first inventor of them, or at least the first who put them in practice, was Frederick Jambelli, an Italian engineer, at the siege of Antwerp by the Spaniards under Alexander, prince of Parma, in the year 1585. A very particular and interesting relation of their wonderful effects is given by Strada, in his "History of the Belgic

Belgic War." The great destruction made by these caused several others to be tried; but none of them succeeded. At Dunkirk and St. Maloes they were tried by the English; at Havre de Grace by the English and Dutch, under king William; and one was constructed by the French to be used against Algiers, in 1688, but it was not employed. St. Remi, in his Memoirs of Artillery, has given a section and view of the infernal used at St. Maloes. See a description and figure of it in Grose's Military Antiquities, v. i. p. 410.

INFERTILITY. See FERTILITY.

INFIBULATION, in *Antiquity*. It was a custom among the Romans, to infibulate their singing boys, in order to preserve their voices: for this operation, which prevented their retracting the prepuce over the glans, and is the very reverse to circumcision, kept them from injuring their voices by premature and preposterous venery: serving as a kind of padlock, if not to their inclinations, at least to their abilities. It appears by some passages in Martial, that a less decent use was made of infibulation among the luxurious Romans: for some ladies of distinction, it seems, took this method of confining their paramours to their own embraces. Juvenal also hints at some such practice. Celsus, a chaste author, says, infibulation was sometimes practised for the sake of health; and nothing destroys it more than the silly practice this operation seems intended to prevent. This practice is not perhaps likely to be revived; if, however, any one who has suffered in his constitution by preposterous venery, should be able to get children, and should be inclined to prevent the same misfortune in them, by infibulation; the method of doing it is thus:

The skin which is above the glans is to be extended, and marked on both sides with ink, where it is perforated, and then suffered to retract itself. If the marks recur upon the glans, too much of the skin has been taken up, and we must make the marks farther; if the glans remain free from them, they shew the proper place for affixing a fibula: then pass a needle and thread through the skin where the marks are, and tie the threads together; taking care to move it every day, until the parts about the perforations are cicatrised: this being effected take out the thread, and put in the fibula; which the tighter it is the better. Celsus, lib. vii. cap. 25.

Authors have not determined what the fibula of the ancient surgeons was, though no doubt they were for different purposes. In the present case, the fibula seems to mean a ring of metal, not unlike what the country people put through the noses of swine.

INFIDEL, a term applied to such persons as are not baptized, and that do not believe the truths of the Christian religion. See DEIST.

INFIerno, in *Geography*, one of the smaller Canary islands, between Lancerotta and St. Clara.

INFUESTO, a town of Spain, in the province of Asturias; 20 miles E. of Oviedo.

INFILTRATION, in *Geology*, is one of the processes of nature, by which stony hardness seems to have been given or increased in mineral substances or strata, in certain situations, effected by the infiltration or soakage of water laden with stony particles, through porous substances, and then depositing their lapidiferous contents: Mr. Kirwan, in his "Geological Essays," pages 45, 128, 131, and 412, has considered this mode of indurating the terrestrial strata, and quoted a number of curious mineral changes and appearances ascribed to this agent.

INFINITE, that which has neither beginning nor end: in which sense God alone is infinite.

INFINITE is also used to signify that which has had a beginning, but will have no end: as angels, and human souls.

This makes what the schoolmen call *infinitum a parte post*; as, on the contrary, by *infinitum a parte ante*, they mean that which has an end, but had no beginning. See INDEFINITE and FINITE.

INFINITE, in *Mathematics*, is applied to quantities which are either greater or smaller, than any assignable ones. In which sense it differs not much from what we otherwise call *indefinite* or *indeterminate*. Thus, an

INFINITE, or *Infinitely great line*, in *Geometry*, denotes only an indefinite or indeterminate line; to which no certain bounds or limits are prescribed.

INFINITE Quantities. Though the idea of magnitude infinitely great, or such as exceeds any assignable quantity, does include a negation of limits; yet all such magnitudes are not equal among themselves; but besides infinite length and infinite area, there are no less than three several sorts of infinite solidity; all of which are quantities *sui generis*; and those of each species are in given proportions.

Infinite length, or a line infinitely long, is to be considered, either as beginning at a point, and so infinitely extended one way; or else both ways from the same point: in which case the one, which is a beginning of infinity, is one-half of the whole, which is the sum of the beginning and ceasing infinity, or infinity *a parte ante*, and *a parte post*, which is analogous to eternity in time or duration; in which there is always as much to follow, as is past any point or moment of time.

Nor does the addition or subtraction of time, length or space of time, alter the case, either as to infinity or eternity; since neither the one nor the other can be any part of the whole.

As to infinite surface or area, any right line infinitely extended both ways on any infinite plane, divides that plane into equal parts, the one to the right, and the other to the left of the said line; but if from any point in such a plane, two right lines be infinitely extended, so as to make an angle; the infinite area, intercepted between these infinite right lines, is to the whole infinite plane, as the arc of a circle drawn on the point of concurrence of those lines as a centre, intercepted between the said lines, is to the circumference of the circle; or as the degrees of the angle to the 360 degrees of a circle.

For an example—Two infinite right lines meeting at a right angle on an infinite plane, do include a quarter part of the whole infinite area of such a plane: if two parallel infinite lines be supposed drawn on such an infinite plane, the area intercepted between them will be likewise infinite; but at the same time it will be infinitely less than the space intercepted between two infinite lines, that arc inclined, though with never so small an angle, because in the one case the given finite distance of the parallel lines diminishes the infinity in one degree of dimension; whereas in a sector, there is infinity in both dimensions; and consequently the quantities are one infinitely greater than the other, and there is no proportion between them.

From the same consideration arise three several species of infinite space or solidity; for a parallelopiped, or a cylinder infinitely long, is greater than any finite magnitude, how great soever; all such solids supposed to be formed on a given basis, are in proportion to one another as those bases. But if two of those three dimensions are wanting, as in the space intercepted between two parallel planes infinitely extended, and at a finite distance; or with infinite length and

breadth, it have a finite thickness ; all such solids shall be as the given finite distances one to another.

But these quantities, though infinitely greater than the other, are yet infinitely less than any of those wherein all the three dimensions are infinite — Such are the spaces intercepted between two inclined planes infinitely extended : the space intercepted by the surface of a cone, or the sides of a pyramid, likewise infinitely continued, &c. all which, notwithstanding the proportion of one to another, and to the ∞ , or vast abyss of infinite space (wherein is the locus of all things that are, or can be) or to the solid of infinite length, breadth, and thickness (taken all manner of ways) are easily assignable — For the space between two planes is to the whole, as the angle of those planes to the 360 degrees of the circle. As for cones and pyramids, they are as the spherical surface intercepted by them, is to the surface of the sphere ; and therefore cones are as the versed sines of half their angles to the diameter of the circle ; these three sorts of infinite quantity are analogous to a line, surface, and solid ; and like them, cannot be compared or have any proportion one to another.

INFINITES, *Arithmetic of*. See ARITHMETIC.

INFINITES, *Characters in Arithmetic of*. See CHARACTER.

INFINITE *Decimals*. See REPETEND.

INFINITE *Distress*, in Law. See DISTRESS.

INFINITE *Proposition*, in Logic. See PROPOSITION.

INFINITE *Series*. See SERIES.

INFINITELY *small quantity*, called also an *infinitesimal*, is that which is so very minute, as to be incomparable to any finite quantity ; or it is that which is less than any assignable quantity.

An infinite quantity cannot be either augmented or lessened, by adding or taking from it any finite quantity ; neither can a finite quantity be either augmented or lessened, by adding to, or taking from it an infinitely small quantity.

If there be four proportionals, and the first be infinitely greater than the second ; the third will be infinitely greater than the fourth.

If a finite quantity be divided by an infinitely small one, the quotient will be an infinitely great one ; and if a finite quantity be multiplied by an infinitely small one, the product will be an infinitely small one ; if by an infinitely great one, the product will be a finite quantity.

If an infinitely small quantity be multiplied into an infinitely great one, the product will be a finite quantity.

In the method of infinitesimals, or of infinitely small quantities, the element by which any quantity increases or decreases, is supposed to be infinitely small, and is generally expressed by two or more terms ; some of which are infinitely less than the rest, which being neglected as of no importance, the remaining terms form what is called the difference of the proposed quantity. The terms that are neglected in this manner, as infinitely less than the other terms of the element, are the very same which arise in consequence of the acceleration, or retardation of the generating motion, during the infinitely small time in which the element is generated ; so that the remaining terms express the element that would have been produced in that time, if the generating motion had continued uniform, as is farther explained under FLUXION.

Therefore those differences are accurately in the same ratio to each other as the generating motions or fluxions. And hence, though infinitesimal parts of the elements are neglected, the conclusions are accurately true, without even an infinitely small error, and agree precisely with those that

are deduced by the methods of fluxions. In order to render the application of this method easy, some analogous principles are admitted, as that the infinitely small elements of a curve are right lines, or that a circle is a polygon of an infinite number of sides, which being produced, give the tangents of a curve, and by their inclination to each other measure the curvature. This is as if we should suppose that when the base flows uniformly, the ordinate flows with a motion which is uniform for every infinitely small part of time ; and increases, or decreases, by infinitely small differences at the end of every such time.

But however convenient this principle may be, it must be applied with caution and art, on various occasions. It is usual, therefore, in many cases, to resolve the element of the curve into two or more infinitely small right lines ; and sometimes it is necessary (if we would avoid error) to resolve it into an infinite number of such right lines, which are infinitesimals of the second order. In general it is a *postulatum* in this method, that we may descend to infinitesimals of any order whatever, as we find it necessary ; by which means any error that might arise in the application of it may be discovered and corrected by a proper use of this method itself.

It is also to be observed, that when the value of a quantity that is required in a philosophical problem becomes, in certain particular cases, infinitely great or infinitely little, the solution would not be always just, though such magnitudes were admitted. As when it is required, to find by what centripetal force a curve would be described about a fixed point that is either in a curve, or is so situated that a tangent may be drawn from it to the curve. The value of the force is found infinite at the centre of the forces in the former case, and at the point of contact in the latter ; yet it is obvious, that an infinite force could not deflect the line described by a body that should proceed from either of these points into a curve ; because the direction of its motion in either case passes through the centre of the forces, and no force, how great soever, that tends towards the centre, could cause it to change that direction. But it is to be observed, that the geometrical magnitude by which the force is measured, is no more imaginary in this than in other cases, where it becomes infinite ; and philosophical problems have limitations that enter not always into the general solution given by geometry.

But although by proper care errors may be avoided in the method of infinitesimals, yet it must be owned that to such who have been accustomed to a more strict and rigid kind of demonstration in the elementary parts of geometry, it may not seem to be consistent with perfect accuracy, that, in determining the first differences, any part of the element of the variable quantity should be rejected, merely because it is infinitely less than the rest ; and that the same part should be afterwards employed for determining the second and higher differences, and resolving some of the most important problems. Nor can we suppose that their scruples will be removed, but rather confirmed, when they come to consider what has been advanced by some of the most celebrated writers on this method, who have expressed their sentiments concerning infinitely small quantities in the precise terms ; while some of them deny their reality, and consider them only as incomparably less than infinite quantities, in the same manner as a grain of sand is incomparably less than the whole earth ; and others represent them in all their orders, as no less real than finite quantities. And although it appears, from what has been said in this article, that a satisfactory account may be given for the brief way of reasoning that is used in the method of infinitesimals ; while nothing is neglected without accounting for it ; and then the harmony between

between the method of fluxions, and that of infinitesimals thus appears more perfect.

And however safe and convenient this method may be, yet some will always scruple to admit infinitely little quantities and infinite orders of infinitesimals, into a science that boasts of the most evident and accurate principles, as well as of the most rigid demonstrations. It is therefore proper, that this extensive and useful doctrine should be established on unexceptionable principles. See the articles FLUXION and LIMIT. See also Mr. Maclaurin's Treat. of Fluxions, in the Introduction, p. 39, 40, &c. and book i. art. 495 to 502.

INFINITELY *Infinite Fractions*, or all the powers of all the fractions whose numerator is one, are together equal to an unit. See the demonstration hereof given by Dr. Wood, in Hook, Phil. Coll. N^o 3. p. 45, seq.

Hence, it is deduced, 1^o. That there are not only infinite progressions, or progressions in *infinitum*; but also infinitely farther than one kind of infinity. 2^o. That the infinitely infinite progressions are notwithstanding computable, and to be brought into one sum; and that not one finite, but so small as to be less than any assignable number. 3^o. That of infinite quantities, some are equal, others unequal. 4^o. That one infinite quantity may be equal to two, three, or more other quantities, whether infinite or finite.

INFINITIVE, in *Grammar*, the name of one of the moods, which serve for the conjugating of verbs.

The infinitive does not denote any precise time, nor does it determinate the number, or persons, but expresses things in a loose indefinite manner; as, *to teach*, &c.

Hence the Latin and modern grammarians have called verbs under this mode, from this their indefinite nature, infinitives. Sanctius has given them the name of impersonals; and the Greeks that of ἀπρὸς ἑαυτὸν from the same reason of their not discovering either person or number.

Infinitives, says Mr. Harris, not only lay aside the character of attributives, but they also assume that of substantives, and are distinguished with their several attributes: *e. g.* "Dulce & decorum est pro patria mori; scire tuum nihil est, &c."

Hence the infinitive has been sometimes called ὀνομαζόμενον, a verbal noun; sometimes ὀνομαζόμενον ἑνὶ ἑαυτῷ, the verb's noun. The reason of the appellation is evident in Greek, by its taking the prepositive articles before it in all cases; thus τὸ γράφειν, τῷ γράφειν, τῶ γράφειν. The same construction is not unknown in English. Thus Spencer,

"For not to have been dipped in Lethe's lake
Could save the son of Thetis *from to die*:" i. *e.*

ἀπὸ τοῦ θανάτου.

The Stoics held the infinitive as the genuine ἑνὶ ἑαυτῷ, or verb, a name which they denied to all other modes; because the true verbal character was conceived to be contained simple and unmixed in the infinitive only: thus, *to walk*, means simply that energy, and nothing more; the other modes, besides expressing this energy, superadd certain affections which respect persons and circumstances. The infinitive, says Priscian, "significat ipsam rem, quam continet verbum." The infinitive, in the application of it, naturally coalesces with all those verbs, that denote any tendency, desire, or volition of the soul, but not readily with others. See Harris's *Hermes*, p. 163, &c.

In most languages, both ancient and modern, the infinitive is distinguished by a termination peculiar to it; as *τελεῖν* in the Greek, *scribere* in the Latin, *écrire* in the French, *scrivere* in the Italian, &c. but the English is defective in this point; so that to denote the infinitive, we are obliged to

have recourse to the article *to*: excepting sometimes when two or more infinitives follow each other.

The practice of using a number of infinitives successively, is a great but a common fault in language; as *he offered to go to teach to write English*.—Indeed, where the infinitives have no dependence on each other, they may be used elegantly enough; as *to mourn, to sigh, to sink, to swoon, to die*.

INFINITO, in the *Italian Music*, is used for such canons or fugues, as may be begun again and again: whence they are also called *perpetual fugues*. See FUGUE.

INFINITY, the quality which denotes a thing infinite. The idea signified by the name infinity is best examined by considering to what things infinity is by the mind attributed, and how the idea itself is framed: finite and infinite are looked upon as the modes of quantity, and are attributed primarily to things that have parts, and are capable of increase or diminution, by the addition or subtraction of any the least part. Such are the ideas of space, duration, and number. When we apply this idea to the Supreme Being, we do it primarily in respect of his duration and ubiquity: and more figuratively, when to his wisdom, power, goodness, and other attributes, which are properly inexhaustible and incomprehensible: for when we call them infinite; we have no other idea of this infinity but what carries with it some reflection on the number, or the extent of the acts or objects of God's power and wisdom, which can never be supposed so great, or so many, that these attributes will not always surmount and exceed, though we multiply them in our thoughts with the infinity of endless number. We do not pretend to say, how these attributes are in God, who is infinitely beyond the reach of our narrow capacities: but this is our way of conceiving them, and these are our ideas of their infinity.

We come by the idea of infinity thus: every one that has any idea of any stated length or space, as a foot, yard, &c. finds that he can repeat that idea, and join it to another, to a third, and so on, without ever coming to an end of his additions. From this power of enlarging his idea of space, he takes the idea of infinite space, or immensity. By the same power of repeating the idea of any length or duration we have in our minds, with all the endless addition of number, we also come by the idea of eternity.

If our idea of infinity be got by repeating without end our own ideas, it may be asked, why do we not attribute it to other ideas, as well as those of space and duration; since they may be as easily, and as often repeated in our minds, as the other? yet nobody ever thinks of infinite sweetness, or whiteness, though he can repeat the idea of sweet or white, as frequently as those of yard or day? To this it is answered, that those ideas which have parts, and are capable of increase by the addition of any parts, afford us by their repetition an idea of infinity; because with the endless repetition there is connected an enlargement, of which there is no end: but it is not so in other ideas; for if to the most perfect idea I have of white, I add another of equal whiteness, it enlarges not my idea at all. Those ideas, which consist not of parts, cannot be augmented to what proportion men please, or be stretched beyond what they have received by their senses; but space, duration, and number, being capable of increase by repetition, leave in the mind an idea of an endless room for more; and so those ideas alone lead the mind towards the thought of infinity.

We are carefully to distinguish between the idea of the infinity of space, and the idea of the space infinite. The first is nothing but a supposed endless progression of the mind over any repeated idea of space; but to have actually in the mind the idea of space infinite,—is to suppose the

mind already passed over all those repeated ideas of space, which an endless repetition can never totally represent to it; which carries in it a plain contradiction. See SPACE.

This will be plainer, if we consider infinity in numbers: the infinity of numbers, to the end of whose addition every one perceives there is no approach, easily appears to any one that reflects on it: but how clear forever this idea of the infinity of numbers be, there is nothing yet more evident than the absurdity of the idea of an actual infinite number. Locke's Essay, vol. i. chap. xvii.

INFINITY of *Actions*, in *Law*; the lord of the soil may have a special action against him who shall dig soil in the king's highway: but one subject may not have his action against another for common nuisances; for if he might, then every man might have it, and so the actions would be infinite, &c. 1 Co. Inst. 56. 9 Rep. 113.

INFIRMARY, a place where the sick and weak belonging to any society, or community, are disposed, either for nursing or cure. See HOSPITAL.

INFLAMMABILITY, is that property of bodies which disposes them to kindle, or catch fire. See FLAME, HEAT, and PHLOGISTON.

INFLAMMABILITY of *Oils*. See OIL.

INFLAMMABLE AIR. See HYDROGEN.

INFLAMMABLE *Springs*. About the middle of the last century, a spring or well at Brofely in Shropshire, was much noticed on account of the inflammable exhalations or gasses which it emitted, so that when a cover was adapted to it, that contracted the stream of air, and a candle was applied, it continued to burn with a lambent blue flame for a long time: but the coal-works in the neighbourhood have long since drained this well. During the driving of Stoke fough, to drain the lead mines near Eyam in Derbyshire, such a quantity of liquid bitumen or rock oil was liberated from the small cavities in the limestone, and from geodes of limestone in the shale above it, that it frequently swam on the water in the fough, in sufficient quantities to take fire and burn for a time, after the application of a lighted candle: this was called by Mr. Bray, in his "Tour" (p. 176.) a burning spring, but improperly, seeing that the bitumen was only set free by the tools of the workmen, and was not spontaneously discharged from the rock, a condition which seems essential to a spring of any kind. See an account of this fough, in Mr. Farey's Report on Derbyshire, vol. i. p. 330.

INFLAMMATION is concerned, either as a cause, symptom, consequence, or complication of the greater number of diseases, to which the human body is liable, and hence it has always been considered by the most enlightened pathologists as a subject which, in point of importance, is inferior to none in the whole circle of medical science. It interests the physician, the surgeon, the accoucheur, and, in short, every individual, who is in the habit of being entrusted with the treatment of any kind of disorder, or accidental injury. A knowledge of the nature and laws of inflammation, and just ideas respecting the means of checking and curing this affection, may be said to constitute a key, or introduction, to the comprehension of diseases in general; for some may be alleged to consist of it, and very few are entirely unattended with it in one stage or another. It is for such reasons, that systematic authors mostly treat of it at the very beginning of their works.

The term inflammation, which is derived from the Latin word *inflammatio*, probably owes its origin to an ancient opinion, that there was fire in the part affected, and, if we advert to the considerable sensation of heat, which the patient experiences in the seat of the complaint, the use of such an expression seems almost natural. The Greeks appear to

have employed terms of similar import, as *φλεγμονη*, or *φλογωσις*, from *φλεγω*, I burn.

Inflammation is divisible into several species. The distinctions chiefly insisted upon by surgical writers, are the *acute* and *chronic*. When inflammation is unattended with any particular disease, it is sometimes called *simple* or *healthy*, of which there can only be one kind. But the *morbid* inflammations, or such as are influenced by the presence of a diseased action, are as numerous and various as diseases themselves, each disease, in fact, having its own specific kind of inflammation; as, for instance, the small-pox pustule, the cow-pox vesicle, the carbuncle, erysipelas, scrofula, the venereal disease, &c.

When common inflammation is spoken of, the acute healthy species is usually implied, or that which is so well known by the name of *phlegmon*. It is attended with four remarkable symptoms in the part affected, namely, pain, redness, swelling and heat: "notæ vero inflammationis sunt quatuor; rubor et tumor, cum calore et dolore." Celsus, lib. iii. cap. 10.

The pain which accompanies the various sorts of inflammation, differs very materially both in its degree and kind. In many instances, indeed, it might be more proper to say, that there is an alteration in the natural sensations and sensibility of the part, than that there is pain, which latter term leads one to understand a degree of agony. Numerous chronic inflammations produce very trivial uneasiness in the part, the patient feeling, perhaps in the seat of the disease, merely a sensation of weight and heaviness. It is likewise remarked by Richerand, that the pruritus, which precedes and attends certain cutaneous eruptions, so far from being painful, occasions rather an agreeable sensation. It is only when the sensibility is carried beyond a particular pitch that it amounts to pain. In phlegmonous inflammation the pain is of a throbbing description, and the suffering is joined with an annoying sense of weight. In erysipelas the pain is of a burning kind. In anthrax it is accompanied by a feeling of stiffness. The severity of the pain is generally in proportion to the vehemence of the inflammation, the sensibility of the parts, and the resistance which their structure makes to the tumefaction.

It is a curious fact, of which the practice of surgery affords many proofs, that parts which, in their natural healthy state, are not remarkable for their great sensibility, are frequently affected when inflamed with an exquisite degree of tenderness and pain. The gums, in the sound state, are not very sensible; they may be divided with a lancet, without any great deal of pain being occasioned: and the pressure of hard substances against them in mastication is not productive of injury. When inflamed, however, in consequence of decayed teeth, a cold, or any other cause, they are affected with extreme sensibility, swell in a considerable degree, and cannot be touched, or pressed, in the slightest manner, without much suffering being excited. The ligaments are naturally almost devoid of sensation; but, in several diseases of the joints, they are even much more painful, than some other inflamed parts, which, when sound, possess a vast deal of sensibility.

A preceding remark, therefore, that the pain is in proportion to the natural sensibility of the parts affected, is not to be received without exceptions. With respect to the immediate way, in which pain is excited in cases of inflammation, it seems most rational to impute the degree of suffering to the augmented sensibility of the nerves, and the unnatural condition in which they are placed. In chronic inflammation, the changes which the parts undergo are slow, and the nerves seem to have time to adapt themselves to the alteration;

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tion; but in acute inflammation, the mutations are quick, and the pain is, for the most part, considerable.

The swelling appears to be occasioned by several circumstances, yet principally by the increased determination of blood to the vessels of the part, and by an effusion of coagulating lymph in the interstices of the cellular substance. The dilatation of the blood-vessels, and the interruption of absorption, probably have also a share in producing the effect.

The considerable injection of the small vessels with red blood, and their great increase of diameter, afford some explanation of the manner in which the preternatural redness arises. It has been a prevailing sentiment, that the redness of common inflammation is partly owing, not merely to a dilatation, but at the same time to an actual increase in the number of the blood-vessels of the inflamed part. New vessels are supposed to be generated. This doctrine, however, is far from resting upon unquestionable evidence. When coagulating lymph is extravasated upon the surface of a wound, an inflamed membrane, &c. it is beyond a doubt often rendered vascular, or, in other words, becomes furnished with new vessels. But, in the extravasated lymph of a phlegmonous tumour, we have no evidence to prove that there is any generation of new vessels. If the vessels have the appearance of being more numerous, it is because their diameters are enlarged, and many, which previously contained only a colourless fluid, are now filled with visibly red blood. Were the extravasated lymph of a phlegmonous swelling to be rendered organized and vascular, the tumefaction and redness would probably be more permanent, and not admit (at least so easily as they often do) of resolution. When adhesions form between two inflamed surfaces, the organized substance, forming the connection, lives after the subsidence of the inflammation, and is a permanent effect. (Dict. of Pract. Surgery.) According to Mr. Burns, the supposition easily admits of refutation; for heat, and many other causes of inflammation, operate so quickly, that there can be no time for the formation of any new vessels; and yet the redness is as great, and the inflammation as perfect, in a minute, as in an hour, or a day, after the application of the exciting cause. (Dissert. on Inflammation). Now that we are noticing the redness of inflamed parts, it may be as well to mention the circumstance of red blood itself being sometimes extravasated, in consequence of inflammation. The occurrence generally indicates, that the inflammatory mischief has been rapid and violent. The most striking instances, which just now present themselves to our mind, are, first, that state of an inflamed eye, termed *chemosis*, for an account of which we refer to OPTHALMY; and, secondly, the spots, produced by effused blood, on the inner coat of the stomach, when this viscus has been inflamed, in consequence of poison. There is still another circumstance, which has been mentioned by the celebrated Mr. John Hunter, as conducive to the red appearance of inflamed parts, *viz.* the blood, after it has become venous, retaining a certain degree of the bright scarlet colour, which it possessed in the arteries. We cannot offer any opinion concerning the truth of the latter suggestion; as coming from Mr. Hunter, it cannot fail to deserve attention.

The experiments which Mr. Hunter made with the thermometer, tend to evince, that the real augmentation of the heat of an inflamed part is inconsiderable, although it seems to be very great, when a judgment is derived from the patient's feelings. If we recollect, that the sensibility of the nerves is augmented, we can no longer be surprized, that they should convey to the sensorium false impressions. With regard to the manner, in which the increased tempera-

ture of inflamed parts is produced, this subject is explicable on the principles, which apply to the production of animal heat in general. We shall merely observe, that there is always a greater determination of blood to a part which is in a state of inflammation, than to the same part when it is not inflamed. The blood flows through it with augmented velocity, and we always find, that the heat of the whole body, as well as of any portion of it, is always in a ratio to the accelerated state of the circulation. When a person runs, he hurries the current of the entire mass of blood, and his whole body is thrown into a heated state. In fevers, the circulation is quickened, and there is likewise general heat. But in inflammation unattended with febrile disorder, the blood flows only through the inflamed part with increased impetuosity, and, of course, the augmentation of heat is local and circumscribed.

Phlegmon, or what may be called common inflammation, has been regarded by many writers as an affection of the cellular membrane. Its frequent occurrence in every situation, both internal and external, has been accounted for by the way, in which the cellular substance pervades the texture of almost every part of the body. Phlegmon is represented as being attended with more swelling than any other species of inflammation. The bright red colour in the centre of the tumour gradually extends towards the circumference, and is insensibly lost on the surrounding skin. The swelling, on the other hand, is distinctly circumscribed. The heat has been compared with that arising from the steam of boiling water. The throbbing, to which we have already adverted, manifestly depends upon the pulsation of the arteries, and is synchronous with the pulse of the whole system. The throbbing particularly affects the patient himself, and the surgeon may plainly perceive it when he touches the part, all the small vessels of which are dilated, and beat in a preternatural degree. In a common whitlow, this vehement throbbing is not confined to the finger, but extends to the large arteries, a considerable way up the arm.

The active mind of the late Mr. John Hunter led him to pay much attention to the interesting subject before us, and from him we have many fertile and original observations. The principles and laws of inflammation were better explained by this philosophical observer, than by any of his professional predecessors. He has noticed the well established circumstance, attending phlegmonous and other inflammations, wheresoever situated, namely, their being always most violent on the side next to the external surface of the body. Thus, when inflammation invades the socket of a tooth, it chiefly takes place towards the cheek, and not on the inside of the alveolar process. He points out, that the situation, position, structure, functions, and distance of the part affected from the source of the circulation, cause considerable variety in the progress and termination of all inflammation. He maintains, that parts, naturally enjoying a vigorous circulation of blood then can bear inflammation better than others in the opposite condition. From this observation, however, he excepts vital parts, which, though they may be exceedingly vascular, do not undergo inflammation favourably, because the natural operations of universal health depend so much upon the soundness of such organs. Mr. Hunter also endeavours to shew, that the depending position of a part seems to have a bad effect on inflammation, probably by retarding the return of the blood. It is one of the same author's principles, that new-formed parts, as many tumours and excrescences, callus, scars, &c. possess less vitality than is the share of

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other parts, which constitute a portion of the original fabric of the body: hence, when inflamed, they are exceedingly apt to be destroyed by ulceration, or mortification.

When an inflammation is of trivial extent, and not seriously painful, the effects of the complaint are altogether local. In the contrary case, the whole circulation partakes in the excitement, and the inflammatory fever occurs.

The blood, taken from a patient labouring under inflammation, is well known by all medical practitioners to exhibit peculiar appearances. The blood, when it has escaped out of the living vessels, spontaneously separates into two distinct parts, the serum and the crassamentum. The last is a compound substance, consisting chiefly of coagulating lymph and red globules, the most heavy ingredients in the blood. Now, it is to be observed, that blood, taken away from persons affected with inflammation, is longer in coagulating, and coagulates more firmly, than when drawn from people in other circumstances. Hence the red globules, which are very heavy, not being so soon entangled in the lymph, descend by their gravity more deeply from its surface, which, being in this manner more or less divested of the red colouring matter, is, from its appearance, termed the *buffy coat*, or *inflammatory crust*. The firmer and more compact coagulation of the lymph compresses out an unusual quantity of serum from it, and the surface of the *fixy* blood, as it is frequently called, is often formed into a hollow, the edges being drawn inwards. These changes in the blood are, in some cases, a more infallible proof of the existence of inflammation than the pulse itself. At the same time, it is probably only a criterion of some unusual operation going on in the system; for the blood, taken away from pregnant women, is always found to exhibit the above appearances, a circumstance which should always be recollected. In peritoneal inflammation, the patient sometimes seems to be in the most feeble state, and the pulse, abstractedly considered, would rather induce the practitioner to employ tonics and stimulants, than evacuations; but should the continuance, or exasperation of the disorder, or any other reason, lead the surgeon to use the lancet, then the *buffy coat*, the *concave surface* of the blood, and the *large quantity of serum*, clear away all doubt concerning the existence of inflammation. But every practitioner ought to bear in his mind, that, besides pregnant women, there are a few anomalous constitutions met with, where the blood, taken away by the lancet, always exhibits the foregoing peculiarities, though inflammation may not prevail.

We see three very remarkable effects follow the prevalence of inflammation; *viz.* adhesions of parts of the body to each other; the formation of pus, or suppuration; and ulceration, a process in which the lymphatics are more concerned than the blood-vessels. Hence Mr. Hunter termed the different stages of inflammation the *adhesive*, the *suppurative*, and the *ulcerative*.

All parts of the body are not equally liable to each of the preceding consequences. It was remarked by Mr. Hunter, that, in the cellular membrane, and in the circumscribed cavities, the adhesive stage takes place more readily than the others; suppuration may be said to follow next in order of frequency; and, lastly, ulceration. Whenever mucous membranes are affected, the suppurative inflammation comes on more readily, than either the adhesive or the ulcerative. Here adhesions, which originate from the slightest degree of inflammation in other situations and structures, can only be produced by the most violent kind. Indeed, ulceration is much more frequently met with upon mucous surfaces than adhesions. The cellular membrane

appears to be much more susceptible of the adhesive inflammation than the adipose, and much more readily passes into the suppurative. Thus, we see the cellular substance, connecting the muscles together, and the adipose membrane to the muscles, inflaming and suppurating, and the matter separating the muscles from their lateral connections, and even the fat from the muscles, while the adipose substance and the skin are only highly inflamed. Yet, it must be allowed, that in situations where fat abounds, we very frequently meet with abscesses. This is so much the case, that Mr. Bromfield accounted the fat a more common nidus for collections of matter, than the cellular substance itself. Thus abscesses about the anus, mammae, &c. are remarkably frequent. When we speak of the fat inflaming and suppurating, we should rather say, that the membranous cavities containing this secretion are so affected; for, fat itself has no vessels, principle of life, nor action of its own, and, consequently, cannot be supposed to be capable of undergoing inflammation and suppuration.

Parts of the body, which lie deeply from the surface, but more particularly such as are known by the name of vital, are readily affected with the adhesive inflammation. That they are not so much disposed to suppurate as the superficial parts are, is strikingly illustrated in cases of extraneous bodies, which, if deeply lodged, only produce the adhesive inflammation. By this process a cyst is formed, in which the foreign body lies, without much inconvenience to the patient, and may even change its situation, without seriously disturbing the parts through which it passes. But no sooner does it approach the skin, than abscesses immediately arise.

Much might be said concerning the difference of the pulse in the various cases of inflammation. Thus, when any part of the surface of the body is affected with a certain degree of phlegmonous inflammation, the pulse is generally full, frequent, and strong. When the peritoneum and bowels are inflamed, it is very quick and small, &c. We shall not, however, enlarge upon this topic, as the state of the pulse, in the several cases, will be noticed in the many articles of this work appropriated to the consideration of inflammatory diseases.

According to Mr. Hunter, the susceptibility of the body for inflammation is of two kinds; the one *original*, constituting a part of the animal economy, and beyond the reach of human investigation; the other *acquired* from the influence of climate, habits of life, and state of the mind over the constitution. The first kind of susceptibility, being innate, cannot be diminished by art; the second may be lessened by the mere avoidance of the particular causes upon which it depends. These latter might be named *predisposing*.

With regard to the *remote*, *exciting*, or *occasional* causes of inflammation, they are infinite in number; but very easy of comprehension, because most of them are referrible to two general classes. The first includes all such as operate by their stimulant or chemical qualities, as, for instance, heat, cantharides, sulphuric acid, aqua ammoniac puræ, &c. The second embraces such as act mechanically, as bruises, wounds, fractures, &c.

The principle on which cold becomes an exciting cause of inflammation, is yet contested among surgical writers, and may still be considered as not decidedly known.

Fevers would sometimes appear to be the exciting causes of inflammation. The local affection, thus originating, is often called *critical*, and is supposed by many to be the means, by which a stop is put to the constitutional indisposition.

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sition. Strong injunctions are, therefore, given not to repress an inflammation of this kind, lest the method should be productive of some worse and even fatal disorder. We have always considered this mode of reasoning unsatisfactory, and should have little apprehension of any real evils, which might arise from the attempt to diminish an inflammation, that appears as a consequence of a fever.

The following observations respecting the proximate cause of inflammation, are taken from Mr. S. Cooper's Dictionary of Practical Surgery.

Numerous opinions have been entertained upon this subject; but almost every theory has been built upon the supposition of there being some kind of obstruction in the inflamed part.

While the circulation of the blood was unknown, and the hypothetical notions of the power of the liver, in preparing and sending forth this fluid continued to prevail, it is not astonishing, that the theories of physic should be exceedingly imperfect. So fully persuaded were physicians of the existence and influence of different humours and spirits, and so little did they know of the regular and constant motion of the blood, that they believed in the possibility of depositions and congestions of the blood, the bile, or lymph; and acknowledged these as the cause of inflammation. Their anatomists taught them, and their professors of physic supported the opinion, that the liver was the centre of the vascular system, from which the blood went forth by day to the extremities, and returned again by night. If then any peccant matter irritated the liver, the blood was sent out more forcibly; and if, at the same time, any part of the body were weakened, or otherwise disposed to receive a greater quantity of fluid than the rest, then a swelling was produced by the flow of humours to this place. Fluxions, or flows of humour to a place, might happen either from weakness of the part which allowed the humours to enter more abundantly, or from the place attracting the humours, in consequence of the application of heat or other agents.

The peculiar nature of the swelling thus occasioned was supposed, by the ancients, to depend upon the kind of humour. Blood produced the true phlegmon, bile, erysipelas, &c.

The ancient physicians also entertained an idea, that the blood and humours might slowly stagnate in a part, from a want of expulsive power, and this affection was termed a *congestion*, while the expression *fluxion* or *defluxion* was used to denote any swelling arising from the sudden flow of humours from a distant part. The first was formed gradually without much pain, or the feeling of pulsation, and ran its course slowly; the second appeared suddenly, was very painful, had a pulsatory feel, and was rapid in its progress. The ancients, who supposed that the blood had very little motion, and that its course could be easily directed or changed, recommended bleeding from some part which was remote from a recent inflammation, by which they imagined that the current of blood was altered, and a *revulsion* made. A revulsion was also made by raising a tumour in some other part, by means of ligatures, cupping-glasses, &c. or by giving nature an opportunity of discharging the humours from distant parts, by applying leeches or blisters. Hence sinapisms were applied to the feet in diseases of the superior parts.

When blood was drawn from the vicinity of the fluxion, or congestion, the mode was called *derivation*, which only differed from *revulsion* in the distance to which the humour was drawn being less.

We shall not enter further into an account of the practice

of the ancients in the treatment of inflammation; but shall refer the reader to what Mr. Burns has written on the subject. Our present object is only to trace the leading doctrines which have at different times prevailed, respecting the proximate cause of inflammation.

From the theories of *fluxion* and *congestion*, which were quite incompatible with the laws of the circulation of the blood, we turn our attention to the doctrine of *obstruction*.

Boerhaave inculcated, (Aph. 375 et seq.) that inflammation was caused by an obstruction to the free circulation of the blood in the minute vessels, and this obstruction, he supposed, might be caused by heat, diarrhoea, too copious flow of urine and sweat, or whatever could dissipate the thinner parts of the blood and produce a thickness or viscosity of that fluid. When the lentor did not exist before the production of inflammation, he imagined, that the larger globules of the blood got into the small vessels, and thus plugged them up. When, for instance, the perspiration was stopped, the fluid, being retained, dilated the vessels, and allowed some of these mischievous globules to enter, and produce a more permanent obstruction. This circumstance was termed an *error loci*, and was one of the chief causes assigned for inflammation. The obstruction, whether caused by *viscosity* or an *error loci*, was imagined to occasion a resistance to the circulation in the part affected; hence increased it in the other vessels, proving an irritation to the heart, and augmenting the force or attraction of the blood in that part of the vessel which was behind the obstruction. This caused heat and pain, while the accumulation of the blood produced redness; which three symptoms are the essence of the disease. Besides *obstruction*, Boerhaave also brought into the account an *acrimonious state of the fluids*, which rendered resolution out of the question, and gangrene likely to follow. Aph. 388.

The viscosity of the blood cannot be admitted as the proximate cause of inflammation; because we have no proof that this state ever exists; or, granting that it did, it would not explain the phenomena. Were a viscosity to occur, it would exist in the whole mass of blood, would affect every part of the body alike, and could not be supposed to produce only a local disorder. How also could such a lentor be produced by causes which bring on inflammation suddenly, without there being time for changes of the fluids to take place?

With regard to the doctrine of *error loci*, or of red globules going into vessels, which did not formerly transmit them, the fact must be admitted, at the same time, that the conclusion is denied. When the eye becomes inflamed, the tunica conjunctiva is seen with its vessels full of red blood, which in health is not the case; but this redness never appears until the inflammation has commenced; and must, therefore, be considered as an effect, not a cause. Nor can this error loci occasion any obstruction in these vessels; for if they be divided, the blood flows freely, which shews, that they are large enough to allow an easy circulation.

Boerhaave's theory of obstruction was too circumscribed, and too mechanical; it reduced all inflammations to one species. The only distinctions which could have arisen, must have proceeded from the nature of the obstruction itself. This doctrine could never account for the action of many specific diseases and morbid poisons.

As for the supposition of the co-operation of an *acrimony of the fluids*, the proportion of the saline matter of the blood has never been proved to be greater in this, than in any other state of the body. Even were a general disorder of this kind to be admitted, no rational explanation of the proximate cause of local inflammation could be deduced from it.

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Dr. Cullen attributed the proximate cause of inflammation to a "spasm of the extreme arteries supporting an increased action in the course of them." This theory only differs from that of Boerhaave in the cause which is assigned for the obstruction. Some causes of inequality in the distribution of the blood, may throw an unusual quantity of it upon particular vessels, to which it must necessarily prove a stimulus. But, farther, it is probable that, to relieve the congestion, the vis medicatrix nature increases still more the action of the vessels; and which, as in all other febrile diseases, it affects, by the formation of a spasm on their extremities. "A spasm of the extreme arteries, supporting an increased action in the course of them, may, therefore, be considered as the proximate cause of inflammation; at least, in all cases not arising from direct stimuli applied; and even in this case, the stimuli may be supposed to produce a spasm of the extreme vessels."

The inconsistencies in Cullen's theory are very glaring. The congestion or accumulation of blood, which is only an effect or consequence of inflammation, is set down as the cause of the spasm of the vessels, to which spasmodic contractions Cullen, strangely enough, assigns the name of proximate cause. The spasmodic contraction of the extremities of the vessels, instead of propelling the accumulated quantity of blood, would render the passage of the blood from the arterial into the venous system still more difficult. Spasmodic constriction of the small vessels is so far from being a satisfactory explanation of the proximate cause of inflammation, that even tying a large vessel does not of itself bring on the affection. Phlegmon is also attended with an effusion into the cellular substance from the extremities of the arteries; a circumstance not easily explained upon the principle of obstructed circulation. See Burns on Inflammation.

We shall now notice the celebrated, and very original opinions promulgated on this subject by the famous John Hunter. According to him inflammation is to be considered only as a disturbed state of parts, which requires a new, but salutary mode of action, to restore them to that state, wherein a natural mode of action alone is necessary. From such a view of the subject, therefore, inflammation, in itself, is not to be considered as a disease, but as a salutary operation, consequent either to some violence, or some disease. Elsewhere, the author remarks, the act of inflammation is to be considered as an increased action of the vessels, which, at first, consists simply in an increase or distention beyond their natural size. This increase seems to depend upon a diminution of the muscular power of the vessels, at the same time that the elastic power of the artery must be dilated in the same proportion. This is, therefore, something more than simply a common relaxation; we must suppose it an action in the parts to produce an increase of size, to answer particular purposes, and this Mr. Hunter would call an act of dilatation. The whole is to be considered as a necessary operation of nature. Owing to this dilatation, there is a greater quantity of blood circulating in the part, which is according to the common rules of the animal economy; for, whenever a part has more to do than simply to support itself, the blood is there collected in larger quantity. The swelling is produced by an extravasation of coagulable lymph, with some serum; but this lymph differs from the common lymph, in consequence of passing through inflamed vessels. It is this lymph which becomes the uniting medium of inflamed parts; vessels shoot into it, and it has even the power of becoming vascular itself. The pain proceeds from spasm. The redness is produced either by the arteries being more dilated than the veins, or because the blood is not changed

in the veins. When, after an injury, a part cannot be restored to health by inflammation alone, or by adhesion, then suppuration, as a preparatory step to the formation of granulations, and the consequent restoration of the part, takes place. The vessels are nearly in the same state as in inflammation; but they are more quiescent, and have acquired a new mode of action. See Hunter on the Blood, Inflammation, &c.

An increased action of the vessels is now almost universally regarded as the proximate cause of inflammation. This opinion derives strong support from a review of the several exciting causes of the affection, which, being in general of an irritating nature, must, when applied to living or sensible parts, occasion a preternatural exertion of their vessels. The method of cure tends also to confirm the common sentiment concerning the proximate cause of inflammation. See Dictionary of Practical Surgery.

Treatment of Inflammation.—According to the preceding views of the subject, the first and principal object to be aimed at in the treatment of inflammation, is to diminish that immoderate action of the arteries, which exists in so conspicuous a degree. There are several means conducive to this end; but that which demands primary attention, and, indeed, which seems to be indicated by common sense, is to remove, if possible, whatever constitutes the remote or exciting cause of the inflammation. Thus, supposing the eye were to inflame in consequence of a small insect lodging under the eyelids, how obvious would be the propriety of immediately taking away the source of irritation? If the irritation of a thorn or splinter should excite inflammation, who would not of his own accord endeavour to extract the extraneous substance? When the affection is excited by extravasated urine, by pressure, friction, stimulating applications, &c. the surgeon often has it in his power to render most essential service, by removing at once what excites and keeps up the complaint. Frequently, the exciting cause is transient in its operation, and yet, the inflammation cannot be prevented from running a certain course. Thus, many kinds of external violence are inflicted in a moment; but inflammation must follow, and go through its operations, though the duration of the circumstance which gave rise to the process has ceased. The living solids demonstrate, in these instances, a kind of reaction. Since, therefore, the removal of the stimulus which excites inflammation will not always put an immediate stop to the complaint, however it may tend to alleviate it, we are generally called upon to moderate, by other means, the increased vascular action.

There are few persons so entirely ignorant of the subject before us, as not to know that bleeding is one of the most powerful means of counteracting inflammation. This well known fact, which has obtained the assent of the most celebrated physicians and surgeons in every age and country, can hardly fail to be quite congenial with such ideas and expectations as are naturally impressed upon the mind by a description of the disorder. Indeed, one principal effect of the increased action of the vessels, is the transmission of a larger quantity of blood through the inflamed part. The propriety of endeavouring, therefore, in most cases, to diminish this determination of blood to the seat of the inflammation, cannot be doubted. The chief mode of accomplishing this object is by general and topical bleeding. Thus evacuation is called *general*, when the blood is taken from a large vessel, at a distance from the inflamed part; *local* or *topical*, when the blood is evacuated by leeches, scarifications, or cupping, from the vessels which are near, or belong to the inflamed part. General bleeding is not so invariably proper as topical.

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cal. Inflammation is a local affection, and therefore must particularly require local curative means. Objections have been urged against topical bleeding, except when the skin, over and near the inflamed part, is itself free from the inflammation. However, most surgeons in this country think otherwise; they put leeches on the inflamed skin, and even scarify the dilated vessels of the conjunctiva, in cases of ophthalmia, as we think, with decided good effect. It is also an incontrovertible truth that bleeding is generally more effectual, the nearer the evacuation is made to the seat of the inflammation. But it is not always in our power to take away a sufficient quantity of blood in this manner. Many inflammations must be immediately checked, or the patient is destroyed. Therefore, when inflammation affects a part of such consequence in the animal economy that it cannot undergo much disturbance, without life itself being endangered, the surgeon is not to be satisfied with local measures. Thus, when the brain, the lungs, the stomach, the bowels, &c. are inflamed, the inflammation, unless suddenly arrested, will inevitably end in death. Also, when the inflamed parts are endued with inferior powers of recovery, it is often necessary to have recourse to general as well as topical bleeding; as in inflammation of a joint. When inflammation is situated in an organ, where suppuration would certainly destroy its uses, it is likewise advisable to moderate the local affection, even at the expence of the whole system. Ophthalmia is a case of this kind. Moreover, it ought to be well understood that every considerable and extensive phlegmonous inflammation, wheresoever situated, ought always to be resisted by general bleeding.

There is no utility in bleeding, when the inflammation and fever are trivial, and the cause of the disorder can be entirely removed. Such evacuation must often be hurtful and dangerous, when the patient is much debilitated by previous indisposition, extreme age, or any other circumstance. The symptomatic fever, attendant on inflammation, can seldom be of itself a just ground for bleeding, as it constantly increases and subsides with the local affection. We are, therefore, to be principally guided by the state of the inflammation. Bleed with a view of diminishing this, but never for the sole purpose of lessening the fever.

It is a principle very generally acknowledged by surgeons, that the efficacy of bleeding is greater the sooner it is practiced, the nearer it is done to the part affected, and the more suddenly the blood is discharged. Hence, when an organ, like the brain, is inflamed, and it is an object of infinite moment to put an immediate check to the inflammation, the surgeon should take away in the first instance sixteen or twenty ounces of blood, if possible, from the temporal arteries; but if that quantity cannot be thus procured, the deficient proportion ought to be taken from the arm.

Another plan, calculated to check and diminish inflammation, and which is necessary in almost all cases, is to give the patient mild aperient medicines, such as Epsom salt, Glauber's salt, magnesia fulphas, &c. Strong drastic purgatives, by their irritation on the constitution, are seldom allowable, and almost always prove hurtful. Gentle purging is even more invariably proper, in all cases where inflammation already exists, or is to be apprehended, than bleeding; for this latter evacuation is productive of more lasting weakness, and therefore, in slight cases, and weak habits, is generally dispensed with. Purgings probably counteracts inflammation, first by increasing the secretion of the bowels, so as to lessen the quantity of the circulating fluids; and secondly, by specifically diminishing every operation going on in the body, and among others, inflammatory action.

In many instances, the effect of the aperient medicines is

to be promoted with clysters. Indeed, there are some examples, where the latter are safer than purgatives given by the mouth: when the peritoneum and bowels are inflamed, the prudent surgeon is often afraid to prescribe any very active opening medicines. Perhaps he ventures to exhibit half an ounce of the oleum ricini, which frequently does not take effect, although the dose be repeated, until assisted with a clyster.

Antimonial medicines have acquired considerable reputation in numerous cases of inflammation, and, as far as we can judge, they are really of eminent service. Nauseating doses of antimonium tartarizatum prove advantageous in several ways; they relieve that oppressive dryness of the skin, which accompanies the fever attendant on severe local inflammation; they promote all the excretions; and they diminish the increased action of the inflamed part. The latter effect is produced, because, whenever an inclination to sickness prevails, the sympathy of the whole constitution with the stomach is so intimate, that the system is immediately thrown into a temporary state of debility, every considerable operation in the machine becoming lowered, and, among others, the process of inflammation. When the inflammation is dangerous, and there is urgent reason for putting an immediate check to it, the employment of antimonials ought never to be neglected. Thus, when the brain or its membranes are affected with inflammation, it is usual to exhibit small doses of antimony.

Opium is not prescribed in cases of common inflammation, unless the severity of the pain render this medicine indispensably necessary; for it is generally considered as a powerful stimulant, and therefore hurtful in regard to the local complaint. Instances, however, certainly do present themselves, in which opium is proper. Procuring the patient ease and sleep, during the violence of many severe inflammations, is an object of the highest importance; and, it may be questioned whether the inflammation itself would not be aggravated more by leaving the patient to all his pain and restlessness, than by making an attempt to diminish his sufferings, and lull him to sleep by opiates. One thing seems certain, that if opium is to be given in cases where pain and inflammation exist, it should be prescribed in an adequate dose. Thus, after any great operation, such as an amputation, the removal of a breast, &c. the surgeon should give from twenty-five to forty drops of the tinctura opii; small doses of opium, in such cases, always have the effect of seriously increasing the restlessness, fever, &c. instead of affording ease, and procuring sleep.

The patient's regimen and diet are to be low; no spirits nor fermented liquors are allowable; and when the inflammation is at all extensive, or such as to be of consequence, the patient should abstain from eating meat, and live on thin broths, barley-water, tea, &c. The practitioner would in vain make depletions in order to stop an inflammation, while his patient was living upon gross, hot, stimulating dishes. On the contrary, when the regimen and diet are such as they ought to be, the patient will do with less evacuations, and his health will not be so much injured by the requisite treatment. He should be advised to drink plentifully of diluent cooling beverages, like lemonade and acidulated barley-water. Oranges, strawberries, saline draughts, &c. may be permitted, as being exceedingly grateful to patients, who are feverish and thirsty, from being affected with any serious degree of inflammation. The patient's chamber should be kept cool, nor ought he to be covered with too much bedding. The antiphlogistic regimen, moreover, requires perfect repose both of body and mind.

With

With regard to the topical applications, these are generally either cold astringent lotions, or else warm relaxing emollients. Heat is well known to promote and increase all animal actions, and must therefore tend to keep up and augment the process of inflammation. Hence arises the indication to diminish the heat of the part affected, by making use of cold topical applications, and maintaining a continual evaporation from the inflamed surface. The common plan is to dip linen in the saturnine lotion, and after folding it once or twice, lay it all over the part affected, taking care afterwards to keep it constantly wet with the application. In some instances cold water will answer every purpose; in others the aqua ammoniæ acetatæ, or lotions of the sulphate of zinc, alum, &c. may be employed. Poultices made with linseed-meal and water, or with bread and milk, are the ordinary emollient applications when such are considered proper. Those of the first kind are frequently preferable to the latter, which are apt to turn sour and acquire an irritating quality, a circumstance of high importance where the cuticle is detached, ulceration is present, or the part is exquisitely sensible. When poultices are used, fomentations are also frequently proper, as having in all severe cases a great effect in lessening the pain. Likewise, when suppuration is unavoidable, they accelerate the cure by promoting the formation of matter, and hastening its approach to the surface of the body. The common method is to dip flannels in a decoction of chamomile flowers, or white poppy heads, wring them, and apply them very warm to the inflamed part.

In discriminating the cases which require cold applications from others to which warm ones are most serviceable, the practitioner should always bear in mind, that when suppuration is inevitable, it is invariably most advantageous to discontinue cold astringents without delay. In general, where the chance of the inflammation being resolved is great, cold applications are best; but sometimes the choice of the topical remedies must be partly regulated by the patient's feelings. There are some patients who seem to derive most ease from cold applications: there are others who appear to experience most comfort from cold ones. The latter remedies ought perhaps rather to have the preference, when the prospect of preventing suppuration is fair and rational, and when at the same time they afford as much ease as poultices.

In technical language, inflammation is said to have different terminations. When the redness, swelling, heat, and pain, all gradually subside, without any formation of matter, the case ends in what is termed *resolution*, which is the most favourable event that can happen.

In some instances, a change takes place in the action of the vessels of the inflamed part, and they assume the power of secreting pus, or matter. Thus an abscess is formed, and the case (surgically speaking) terminates in *suppuration*.

In certain examples, ulceration is a direct consequence of inflammation, but in general an abscess precedes the fore.

The last termination of inflammation, to be noticed here, is in *mortification*, which is the worst, but happily the least frequent result of common cases. See GANGRENE, SUPPURATION, &c.

For an account of particular kinds of inflammation, see ERYSIPELAS, ANTHRAX, CARBUNCLE, FURUNCULUS, SCROFULA, LUES VENEREA, &c.

The inflammations of various parts of the body are also treated of under distinct heads. For inflammation of the eye, see OPHTHALMY; for that of the parts about the

anus, see FISTULA in *Ano*; for that of the dura mater, see INJURIES of the Head; for that of the testicle, see HERNIA Humoralis; for that of the fingers, see WHITLOW, &c. &c.

INFLAMMATION of the Bladder. See CYSTITIS.

INFLAMMATION of the Bowels. See ENTERITIS.

INFLAMMATION of the Brain. See PHRENITIS.

INFLAMMATION of the Diaphragm. See PARAPHRENITIS.

INFLAMMATION of the Ear. See OTALGIA.

INFLAMMATION of the Eye. See OPHTHALMY.

INFLAMMATION of the Heart. See CARDITIS.

INFLAMMATION of the Kidneys. See NEPHRITIS.

INFLAMMATION of the Liver. See HEPATITIS.

INFLAMMATION of the Lungs. See PLEURISY, PERIPNEUMONY, and CATARRH.

INFLAMMATION of the Pericardium. See PERICARDITIS, and CARDITIS.

INFLAMMATION of the Peritoneum. See PERITONITIS.

INFLAMMATION of the Spleen. See SPLENITIS.

INFLAMMATION of the Stomach. See GASTRITIS.

INFLAMMATION of the Testes. See HERNIA Humoralis.

INFLAMMATION of the Throat. See CYNANCHE.

INFLAMMATION of the Tonfils. See CYNANCHE Tonsillaris.

INFLAMMATION of the Womb. See HYSTERITIS.

INFLAMMATION, Spontaneous, of earthy matters, in Mining.

It is a curious and important fact, that several pyritic and bituminous thin strata which are found accompanying the coal-seams in some situations, will, on being thrown out or exposed to the air in the works, heat and take fire. This seems particularly the case in the thick coal-seam about Dudley in Staffordshire, as mentioned by Mr. Keir in Shaw's History of Staffordshire. In different parts of Derbyshire there are also thin strata of duns, tows, &c. which thus intumesce and take fire in the coal-works, as at Heanor, Derby-hall and other pits, which are particularized by Mr. Farey in his Report on this county, vol. i. p. 348.

INFLAMMATORY DISEASES, in *Medicine*, are all those diseases in which any part or organ of the body is affected with inflammation, as above described; but these terms, in the general acceptation, imply more particularly those acute and severe inflammations which excite a degree of febrile commotion in the system. In addition to those just enumerated, with references, the gout, acute rheumatism, erysipelas, &c. may be included under the class of inflammatory diseases, and, together with them, constitute, in fact, a distinct Order, in the system of our best nosologist, Dr. Cullen, under the title of *Phlegmasia*; namely, the second order, of the first class, *Pyrexia*, or *Febrile* diseases. See his Nosol. Method.

We judge of the presence of an internal inflammatory disease by the occurrence of the following congeries of symptoms; namely, when, together with a state of *fever*, there is a *fixed pain* in any internal part, attended with some *interruption* in the exercise of its *functions*. It is to be observed, that the concurrence of all these symptoms is necessary to prove the existence of active inflammation in any organ, and that the occurrence of any one or two of them may originate from other causes than inflammation. Thus pain may arise from a spasmodic contraction of the muscular fibres of the part, and it may be moveable, and pass from one part to another; fever may arise with or without pain; and the functions of an organ may be impeded without either pain or fever. In none of these cases are we to conclude that active inflammation is going on. We may illustrate this with respect to inflammation of the lungs, or *peripneumony*. This disease is known to be present, when, together with general *fever* (*i. e.* a frequent pulse, hot skin, thirst,

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thirst, &c.), there is a fixed *pain* in some part of the chest, *cough*, and *difficulty of breathing*. (Cullen, Nosol. Meth. Class i. Ord. ii. Gen. 11.) Now *fever* occurs from many other causes, and without these other symptoms; in which case no pulmonary inflammation is judged to be present. *Pain* may be felt in the chest when there is neither cough nor fever, nor difficult respiration, as in the case of rheumatism in the intercostal muscles, the diaphragm, or perhaps the mediastinum, or in the case of partial or general spasm in these muscles. It may be also felt, with difficulty of breathing, but without fever, as in the case of spasm of the diaphragm, in hydrothorax, or in angina pectoris: or it may concur with fever when there may be no cough, as sometimes happens when the liver is inflamed on the surface contiguous to the diaphragm. Again, there may be an impeded function (*i. e.* in this case *difficulty of respiration*) without fever or pain, as in many cases of asthma and chronic dyspnoea, connected with a spasmodic constriction of the bronchial passages, or a considerable secretion of mucus into the cells and bronchial tubes. But where there is inflammation in the lungs, there is necessarily, in the first place, a symptomatic *fever*; in the next, from the congestion and over-dilatation of the vessels of the inflamed organ, there is a fixed *pain*, and also a difficulty of admission of air into the compressed cells, *i. e.* *difficult breathing*; and the irritation upon the nerves of the bronchiæ, by this congestion, as well as by the mucus secreted, necessarily excites *cough*.

These concurring phenomena, then, of pain and impeded function in any organ, with general fever, are the diagnostic symptoms of all internal inflammatory diseases. But there are still other phenomena which indicate the degree of violence of the inflammation which is going on. These are principally the other conditions of the pulse, besides its frequency, and the appearance of the blood drawn from the veins. Where an acute inflammation subsists, the pulsation of the heart and arteries is generally very vigorous; so that the pulse at the wrist strikes against the finger with a considerable force, and with a sharpness of stroke which elevates the finger, compressing the artery, even when firmly held on it. The terms *hard*, *strong*, and *sharp*, have been used to denote this vigorous pulsation of the artery. The degree of *hardness*, *strength*, or *sharpness* of the pulse, however, varies greatly, not only according to the violence of the disease, but to the vigour of the patient's natural constitution; and it differs also according to the peculiar structure of the organ inflamed; all of which circumstances must be taken into the consideration of the physician before he decide upon the practical treatment which he shall adopt. Even in the most severe inflammation, which a very delicate habit is capable of undergoing, the pulse may be less full and strong than in a slight febrile affection in a robust habit; but there is generally a degree of sharpness in the stroke of the pulse, even in a feeble habit under the excitement of acute inflammation, which the *tail*, acquired by a little experience, enables the physician to estimate. Besides, in such cases, the degree of pain and of impeded function, and the state of the pulse, mutually illustrate each other. If the pain has remained fixed and severe for many hours, and the function of the suffering organ is greatly deranged, although the pulse may betray but a moderate degree of sharpness or hardness in a habit not originally strong, the proper evacuations for the cure of inflammation must be considered as indicated. This is particularly necessary, as we have just hinted, in respect to certain organs. When there is an acute inflammation in the *lungs* or *liver*, and especially when the enveloping membranes are affected, the pulse is perhaps invariably characterized by hardness and strength. (See HEPATITIS and PLEURISY.)

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But when the *stomach* is inflamed, the pulse is often without any considerable hardness, and generally small, but very frequent. In this case, therefore, the existence of acute inflammation might be overlooked, if we judged principally from the pulse; and it is necessary to compare the state of the pulse with the degree of fixed burning pain in the stomach, and the sudden increase of that pain, as well as the vomiting which is excited by any thing whatever that is taken into the stomach, in order to ascertain the nature of the disease. See GASTRITIS.

The other circumstance, which has been mentioned as aiding us in distinguishing the degree of violence of any internal inflammation, is the appearance of the blood drawn from the veins. When the lancet is used in inflammatory diseases, the blood, which is drawn, after standing some time in any vessel until coagulation has taken place, exhibits, on the surface of the *coagulum*, a thick gelatinous substance, without any admixture of red blood: this has been variously termed the *buffy coat*, or simply the *buff*, the *inflammatory crust*, &c.; and has been considered as a proof of the existence of inflammation, and as a test, in a great measure, of the severity of the disease. It is certain, that this buffy crust is commonly found in pleurisy, peripneumony, hepatitis, acute rheumatism, &c., and is not seen where blood flows from a person in ordinary health. It seems to arise from a difference in the mode of coagulation, so that the red particles subside and leave the upper portion of the coagulating lymph untinged; and not to consist of a morbid humour in the blood, as the humoral pathologists believed. But experience has taught us, that the buffy state of the blood is not a criterion, by which the necessity or propriety of blood-letting can be determined in diseases. For, not to mention the absurdity of relying upon a test, which requires the practice to be adopted, to some extent or other, before its propriety can be ascertained, (a doctrine which has often led to the folly of taking away a little blood, "to see how it looked,") observation has proved, that the blood is actually often in the condition to shew the buffy coat, where no inflammatory action is going on, and where, although a certain degree of inflammatory action may be present, yet it will not be removed by blood-letting; but if the blood-letting be repeated, the patient may be destroyed before the buffy coat on the blood will disappear. Thus the buffy coat is almost invariably seen on blood drawn from women in a state of pregnancy; it is likewise seen on that, which is taken from persons labouring under hectic fever, from pulmonary consumption; nay, it has been observed on the blood drawn from patients affected with the *typhus* fever, and with *scurvy* (see Fourcroy, Chimiques; also BLOOD, *morbid alterations of*); in all which cases we should occasion infinite mischief, were we to conceive that this appearance indicated the necessity of repeating the use of the lancet. But, farther, it is a fact, which has not hitherto been satisfactorily explained, that in a violent attack of unequivocal inflammation, as of pleurisy, if, during one bleeding, the blood be received in two or three different vessels, the coagulum in one or two of the vessels shall present the buffy coat, while none will appear on that in the others; and in like manner, if blood-letting be repeated two or three times, the blood of the first drawing shall exhibit no buffy crust, while that of the subsequent drawing shall shew it in large quantity. This variety has been principally attributed to the velocity with which the blood flows from the vein; thus it would appear, that the blood which trickles slowly down the arm, seldom shews so much buff, as that which flows in a full and copious stream. In a word, then, the appearances of the blood drawn in the cure of diseases, is to be considered as a very imperfect guide

in directing the farther use of the lancet, and is only to be deemed a secondary adjuvant in determining the proper mode of practice, in conjunction with a careful investigation of the violence of the symptoms of the disease, its duration, and tendency, and of the age, strength, and constitution of the patient.

In attempting to form an accurate *diagnosis*, in regard to inflammatory diseases, two difficulties present themselves: the first of these is the difficulty of distinguishing the inflammation of one organ from that of another, which is contiguous to it, or in its vicinity. For instance, the leading symptoms of inflammation of the lungs, in very many cases, are present in hepatitis, or inflammation of the liver, on the one hand, and in carditis, and pericarditis, or inflammation of the heart, and of the pericardium, on the other. The distinction, which is commonly supposed to exist between the inflammation of the heart and its membranous bag, and inflammation of the lungs, consists in the occurrence of palpitation, syncope, and an irregular pulse, in the former disease, in addition to the symptoms of the latter: but Dr. Cullen admits that these three symptoms are occasionally absent in *pericarditis*, and accords with the observation of Vogel, that "the symptoms of *carditis* are nearly the same as those of *peripneumony*, but more severe:" i. e. fever, with pain in the left side of the chest, difficulty of breathing, and cough. (See Cullen, Nosol. Meth. Clafs i. Ord. ii. Gen. 13 and 11.) In like manner, these four diagnostic symptoms of *peripneumony* and *pleurisy* are commonly present in inflammation of the liver, especially when the convex side of that viscus, which lies in contact with the diaphragm, is the seat of the inflammation: for in addition to fever, and pain in the side, a difficulty of breathing is occasioned by the suffering, which any attempt to depress the diaphragm in the act of inspiration, excited by compressing the inflamed liver; and a cough, which, however, is commonly dry, or unaccompanied by expectoration, but not always, and which is excited probably by the vicinity of the seat of irritation to the lungs. As the hepatitis proceeds, the other symptoms belonging to it, especially the bilious tinge of the skin and eyes, point out clearly the seat of the inflammation.

It is satisfactory, however, to know that, in such cases of extreme similarity of symptoms, no practical evil can arise from the inability to decide as to the seat of the disease: for, in the first place, the inflammation actually spreads, in some instances, to the contiguous organs, so that the symptoms indicative of the disorder in both must necessarily co-exist; and, in the second place, the inflammation requires the same practical measures to be adopted for its removal, in whatever viscus it may be seated; namely, evacuations proportioned to its violence, and to the vigour of the patient.

The second difficulty, in distinguishing inflammatory diseases, to which we have alluded, arises from the occasional severity and fixed seat of the pain, which is attendant on cramps or spasmodic diseases, more especially in the stomach and the bowels. Hence it is often extremely difficult to pronounce, whether an acute pain in the belly, for instance, is occasioned by the *colic*, or by *enteritis* (inflammation of the bowels), for constipation accompanies both; and although a mere spasmodic pain is very commonly present, without any acceleration of the pulse, or febrile heat; yet when such pain is extremely acute, and has continued for some length of time, the constitution begins to suffer from excessive irritation, and the pulsations of the heart and arteries are quickened; and if it still continues, actual inflammation in the part is liable to ensue, so that what was colic in the commencement, becomes finally enteritis. It is important to discriminate accurately in the outset between these two states

of pain; because that, which is spasmodic, may be removed by large doses of opium, and other antispasmodics; whereas the inflammatory pain would be augmented, and the disease itself rendered more dangerous, by the exhibition of such medicines. In making this discrimination, the practitioner is principally guided by the hardness and force, or the softness and weakness of the pulse;—by the rigidity of fibre and robust habit, or the contrary condition of the patient;—by the unvarying intensity and seat of the pain, or its occasional remissions and slight change of place;—and by a knowledge of the nature of former attacks, of a similar kind, where such have occurred.

The experienced and accurate observer of the phenomena of diseases, therefore, will seldom be at a loss in selecting the proper mode of treatment in such cases: and it is fortunate here also, that the evacuation of blood-letting, which is absolutely necessary to subdue a violent inflammatory affection of the bowels, often succeeds in removing a fixed and severe spasm in the same organs. And as a spasmodic affection, of considerable duration, is liable to terminate in inflammation and its fatal consequences, the depletion of the blood-vessels is indicated, under such circumstances, both as a preventive and as a cure, where the age, strength, and constitution of the patient do not render the safety of such a depletion very equivocal.

In regard to the treatment of inflammatory diseases, we have already in part anticipated the discussion. The great decisive remedy for such diseases is found, in diminishing the quantity of the circulating blood. This operation of blood-letting is supposed to produce its beneficial effects upon the disease, by removing the "stimulus of distention" from the blood-vessels; for it is an ascertained property of the living solid, to contract more forcibly after a great extension of its fibres. It cannot operate by letting out the *morbid matter* or *humour* from the circulating fluids, as the older pathologists imagined; for if we suppose the whole mass of fluids to be impregnated with a morbid humour, how can we, by abstracting a part, purify the condition of the remainder? The fact, however, is fully established, and cannot be invalidated by any error in the hypothesis, which may be framed for the purpose of explaining it. The depletion of the vessels may be effected by opening the smaller branches of the arteries, where they are superficial, and easily subjected to pressure, as in the temples;—or by opening the external veins by the lancet; or by a more limited and topical discharge by means of leeches, and cupping. The circumstances, under which one or other of these modes of depletion is to be preferred, vary materially according to the seat and degree of inflammation, and will be mentioned under the head of each disease. While this mode of reducing inflammatory action is resorted to, it is generally necessary, also, to employ other concurring means; such as purging, exciting a diaphoresis or gentle perspiration, procuring a discharge from the skin in the vicinity of the inflamed organ, by blisters, &c.; and, at the same time, to employ all the negative means of diminishing excitement, which constitute the antiphlogistic regimen; such as avoiding heat, noise, exertion of body or mind, and shunning all solid animal food, condiments, spirituous, vinous, or other fermented liquors, which increase the action of the vascular system.

INFLATION, formed from *in*, and *flatus*; of *flo*, *I blow*; *blowing up*, the act of stretching or filling any flaccid or distensible body, with a flatulent or windy substance.

INFLECTION, called also *diffraction*, and *deflection*, in *Optics*, is a property of light, by reason of which, when it comes within a certain distance of any body, it will either be bent

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bent from it, or towards it; which is a kind of imperfect reflection or refraction. See DIFFRACTION.

This property was first taken notice of by Dr. Hooke; who shews that it differs both from *reflection* and *refraction*; and seems to depend on the unequal density of the constituent parts of the ray, whereby the light is dispersed from the place of condensation, and rarified or gradually diverged into a quadrant: and this deflection, he says, is made towards the superficies of the opaque body perpendicularly. Some writers ascribe the first discovery of it to Grimaldi, the Jesuit. He first published an account of it, in his treatise "De Lumine, Coloribus, et Iride," printed in 1666; nor did any other person lay claim to the discovery, except Dr. Hooke, who communicated his observations on this subject to the Royal Society, in 1672. It appears, however, that Dr. Hooke had not heard of the discoveries of Grimaldi; for he speaks of his own as a discovery of a new property of light, not mentioned by any optical writer before him.

Sir Isaac Newton discovered also, by plain experiment, this inflection of the rays of light; and M. de la Hire assures us he found, that the beams of the stars being observed, in a deep valley, to pass near the brow of a hill, are always more refracted than if there were no such hill, or the observations were made on the top thereof; as if the rays of light were bent down into a curve, by passing near the surface of the mountain.

Sir Isaac Newton, in his Optics, makes several experiments and observations on the inflection of the rays of light; which see under LIGHT, and RAYS.

Although sir I. Newton particularly examined the phenomena, relating to this subject, under a considerable variety of circumstances, his observations were not quite correct; nor was his hypothetical explanation very plausible. Subsequent experiments and observations seem to reduce the phenomena of inflection to a single principle, *viz.* to the attraction of bodies towards light; which attraction becomes conspicuous when the rays of light pass within a certain distance of their surfaces. Besides their being bent, the rays of light are likewise separated into colours by the vicinity of bodies, and this produces the singular phenomenon of the coloured fringes that accompany the inflection. Various experiments have been made relative to the inflection of light by Maraldi, Grimaldi, Delisle, Mairan, Du Tour, Muschenbroek, and others, as well as Newton; an account of which experiments the reader may see in Priestley's History of Vision, Light, and Colours, part vi. § 6.

M. de la Hire observed, that when we look at a candle, or any luminous body, with our eyes nearly shut, rays of light are extended from it, in several directions, to a considerable distance, like the tails of comets. The true occasion of this phenomenon, which has exercised the sagacity of Des Cartes, Rohault, and others, seems to be, that the light passing among the eye-lashes, in this situation of the eye, is inflected by its near approach to them, and therefore enters the eye in a great variety of directions.

INFLECTION, in *Grammar*, the variation of nouns and verbs, in their several cases, tenses, and declensions.

Inflection is a general name, under which are comprehended both conjugation and declension.

INFLECTION, *Point of*, of a curve, in *Geometry*, is a point or place where the curve begins to bend, or turn a contrary way.

If a curve line, as A F K (*Plate X. Analysis, fig. 2.*) be partly concave, and partly convex towards a right line, as A B, or towards a fixed point, the point F, which divides the concave from the convex part, and consequently is at the

beginning of the one and end of the other, is called the *point of inflection*, as long as the curve, being continued beyond F, keeps its course the same: when it returns back again towards that part or side from whence it took its origin, it is called the *point of retrogression*.

To conceive this, it is to be considered, that any quantity, which goes on continually increasing or decreasing, cannot change from a positive to a negative expression, or from a negative to a positive one, without first becoming equal to an infinite, or nothing. It becomes equal to nothing, if it continually decrease; and equal to an infinite if it continually increase.

Now, if through the point F be drawn the ordinate E F, and the tangent F L, and from any point, as M, on the same side of A F, be drawn the ordinate M P, and the tangent M T; then in curves which have a point of inflection, the absciss A P continually increases, and the part A T of the diameter, intercepted between the vertex of the diameter, and the tangent M T, increases also, till the point P fall into E; after which it again begins to diminish: whence the line A T must become a maximum A L, when the point P falls into the point E.

In those curves which have a point of retrogression, the part A T increases continually, and the absciss increases, till the point T falls into L; after which it again diminishes: whence A P must become a maximum, when the point T falls into L.

If A E = x , E F = y , then will A L = $\frac{y \dot{x}}{\dot{y}} - x$ (see TANGENT), whose fluxion, which is $\frac{y^2 \ddot{x} - \dot{y} \dot{x} y}{\dot{y}^2} - \dot{x} = \frac{\dot{y}^2 \ddot{x} - \dot{y} \dot{x} y - \dot{y}^2 \dot{x}}{\dot{y}^2} = -\frac{\dot{y} \dot{x} y}{\dot{y}^2}$, supposing \dot{x} constant,

being divided by \dot{x} , the fluxion of A L must become nothing; *i. e.* $\frac{-\dot{y} y}{\dot{y}^2} = 0$: so that multiplying by \dot{y}^2 , and

dividing by $-y$, $\dot{y} = 0$; which is a general form for finding F, the point of inflection, or retrogression, in those curves whose ordinates are parallel to one another. For the nature of the curve A F K being given, put the equation of the curve into fluxions; from which, or from other properties of the curve, find the value of \dot{x} or \dot{y} , and put this \dot{x} or \dot{y} and its value into fluxions, making both \ddot{x} and $\ddot{y} = 0$: then by expunging the rest of the fluxional quantities, we shall determine the value of x , *i. e.* A E or y , *i. e.* E F, at the point of inflection sought.

To distinguish the points of inflection from those of retrogression, which arise indiscriminately according to the above method, it will be sufficient to attend to the progress of the curve, by taking any ordinate very near the point; which will always serve to remove any doubt on that head.

Ex. 1.—To find the point of inflection B in the curve A B Y (*fig. 3.*) whose equation (putting the absciss A C = x , ordinate C B = y , and the perpendicular A E = a) is $a x^2 = a^2 y + x^2 y$. From the fluxion of this equation, *viz.* $2 a x \dot{x} = a^2 \dot{y} + 2 x \dot{x} y + x^2 \dot{y}$, we deduce $\dot{y} = \frac{2 a x \dot{x} - 2 x \dot{x} y}{a^2 + x^2}$.

i. e. by substituting for y its value $\frac{a x^2}{a^2 + x^2}$, $\dot{y} = \frac{2 a^3 x \dot{x}}{(a^2 + x^2)^2}$; and the fluxion of this equation, making both \ddot{x} and $\ddot{y} = 0$,

is $0 = \frac{2 a^3 \dot{x}^2 (a^2 + x^2)^2 - (4 a^2 x \dot{x} + 4 x^2 \ddot{x}) 2 a^3 x \dot{x}}{(a^2 + x^2)^4}$,
which

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which multiplied by $(a^2 + x^2)^4$ and divided by $2 a^3 \dot{x}$, gives $0 = (a^2 + x^2)^2 - 4 a^2 \dot{x}^2 - 4 x^4$; therefore, $4 \dot{x}^4 + 4 a^2 \dot{x}^2 = (a^2 + x^2)^2$; which equation divided by $x^2 + a^2$ makes $4 \dot{x}^2 = a^2 + x^2$; therefore $3 \dot{x}^2 = a^2$, and $x = a \sqrt{\frac{2}{3}}$; and if this value be substituted for it in the given equation of the curve, we shall have y , or the ordinate at the point of inflection $= \frac{a x^2}{a^2 + x^2} = \frac{\frac{1}{3} a^3}{\frac{4}{3} a^2} = \frac{1}{4} a$. Let

A C be equal to $\frac{1}{3}$ A E, and with the radius c E, describe the arc E C; then will C be the point from which the ordinate to the point of inflection must be drawn: for $e C = \frac{2}{3} a$; and $C e^2 - e A^2 = A C^2$, i. e. $\frac{4}{9} a^2 - \frac{1}{9} a^2 = \frac{1}{3} a^2 = A C^2 = x^2$; or $x = a \sqrt{\frac{2}{3}}$.

Another method of finding the point of inflection, or retrogression, is as follows. From the nature of curvature it is evident, that while a curve is concave towards its axis, the fluxion of the ordinate decreases, or is in a decreasing ratio, with regard to the fluxion of the absciss; and on the contrary, this fluxion increases, or is in an increasing ratio to the fluxion of the absciss, when the curve is convex towards the axis; and hence it follows, that these two fluxions are in a constant ratio at the point of inflection, or retrogression,

where the curve is neither concave nor convex; that is, $\frac{\dot{x}}{\dot{y}}$, or $\frac{\dot{y}}{\dot{x}}$, is a constant quantity. But constant quantities have

no fluxion, or their fluxion is equal to 0; whence we derive this general rule.

Put the given equation of the curve into fluxions; from which equation of the fluxions, find either $\frac{\dot{x}}{\dot{y}}$, or $\frac{\dot{y}}{\dot{x}}$, and take again the fluxion of this fraction, and make it equal to 0, and from this last equation find also the value of the same expression $\frac{\dot{x}}{\dot{y}}$, or $\frac{\dot{y}}{\dot{x}}$; and by equating these two, and the given equation of the curve, x and y will be determined, being the absciss or ordinate answering to the point of inflection. Or, otherwise, putting the fluxion of $\frac{\dot{x}}{\dot{y}} = 0$, that is

$$\frac{\ddot{x} \dot{y} - \dot{x} \ddot{y}}{\dot{y}^2} = 0; \text{ or } \ddot{x} \dot{y} - \dot{x} \ddot{y} = 0, \text{ whence } \ddot{x} \dot{y} = \dot{x} \ddot{y},$$

or, $\ddot{x} : \dot{y} :: \dot{x} : \ddot{y}$, that is, the second fluxions have the same ratio as the first fluxions; and therefore if \dot{x} be constant, or $\ddot{x} = 0$, then shall $\ddot{y} = 0$, which gives the following rule, viz.

Take both the first and second fluxions of the given equation of the curve; in which make $\ddot{x} = 0$, and $\ddot{y} = 0$, and the resulting equations will determine the values of x and y , or the absciss and ordinate answering to the required point.

Thus repeating again the preceding example, in which the given equation is $a x = a y + x^3 y$; and of which the point of inflection is required.

By the first rule, the fluxion of $a x^2 = a^2 y + x^2 y$, is $2 a x \dot{x} = a^2 \dot{y} + 2 x y \dot{x} + x^2 \dot{y}$; whence $\frac{\dot{x}}{\dot{y}} =$

$$\frac{a^2 + x^2}{2 a x - 2 x y}.$$

And now making again the fluxion of this quantity = 0, we have

$$2 x \dot{x} (a x - x y) = (a^2 + x^2) (a \dot{x} - y \dot{x} - x \dot{y}); \text{ whence } \frac{\dot{x}}{\dot{y}} = \frac{a^2 + x^2}{a^2 - x^2} \times \frac{x}{a - y}.$$

And now equating these two expressions, we have

$$\frac{a^2 + x^2}{a^2 - x^2} \times \frac{x}{a - y} = \frac{a^2 + x^2}{2 x} \times \frac{1}{a - y},$$

which being reduced, gives $2 x^2 = a^2 - x^2$, or $3 x^2 = a^2$, and $x = a \sqrt{\frac{2}{3}}$, the same result as before; and this value of x substituted in the original equation of the curve, becomes

$$y = \frac{a x^2}{a^2 + x^2} = \frac{\frac{1}{3} a^3}{\frac{4}{3} a^2} = \frac{1}{4} a, \text{ the ordinate at the point of inflection.}$$

The second method differs from the first rather in enunciation than in principle, the application of it is therefore omitted.

Ex. 2.—Again, let it be proposed to find the point of inflection in a curve whose equation is $b y^3 = a x^3 - x^3$.

The fluxion of this expression gives

$$b^2 \dot{y} = 2 a x \dot{x} - 3 x^2 \dot{x}; \text{ or } \frac{\dot{y}}{\dot{x}} = \frac{2 a x - 3 x^2}{b^2}.$$

Taking again the fluxion of this expression, and making it equal to 0, we have

$$2 a b^2 \dot{x} - 6 b^2 x \dot{x} = 0, \text{ or } 2 a b^2 = 6 b^2 x,$$

because \dot{y} does not enter; whence $x = \frac{1}{3} a$, which is the absciss answering to the point of inflection sought.

Ex. 3.—Let it be proposed to find the point of inflection, or retrogression, in the cubic parabola, with the equation $y = a + \sqrt[3]{(a^3 - 2 a^2 x + a x^2)}$.

By taking the fluxion, we have

$$\dot{y} = \frac{(-2 a^2 + 2 a x) \dot{x}}{3 (a^3 - 2 a^2 x + a x^2)^{\frac{2}{3}}}, \text{ or } \frac{\dot{y}}{\dot{x}} = \frac{\frac{2}{3} (a x - 2 a^2)}{(a^3 - 2 a^2 x + a x^2)^{\frac{2}{3}}}.$$

Taking again the fluxion of this expression, and making it equal to 0, according to the above rule, we have $a \ddot{x}$

$$(a^3 - 2 a^2 x + a x^2)^{\frac{2}{3}} = \frac{2 (-2 a^2 \dot{x} + 2 a x \dot{x}) \times (2 a x - 2 a^2)}{3 (a^3 - 2 a^2 x + a x^2)^{\frac{5}{3}}}$$

because \dot{y} is not found in the second fluxion, which expression being reduced, gives $x = a$; and this value substituted for x , gives also $y = a$; hence the point required is, that answering to these conditions of the absciss and ordinate, which is a point of retrogression, as will appear from considering the nature of the curve.

Ex. 4.—Let it be proposed to investigate the point of contrary flexure in the curve commonly called the *witch*; of which the equation is $y x = a^2 - a^2 x$.

Taking the fluxion of this expression, we have

$$2 y \dot{y} x + y^2 \dot{x} = -a^2 \dot{x}; \text{ or } \frac{\dot{y}}{\dot{x}} = \frac{-(a^2 + y^2)}{2 y x}.$$

Now, again, making the fluxion of this expression = 0, we have

$$-4 y^2 \dot{y} x + (2 x \dot{y} + 2 y \dot{x}) (a^2 + y^2) = 0, \text{ or } 2 x (a^2 + y^2) \dot{y} - 4 y^2 x \dot{y} + 2 y \dot{x} (a^2 + y^2) = 0;$$

whence

$$\frac{\dot{y}}{\dot{x}} = \frac{-2 y (a^2 + y^2)}{2 x (a^2 + y^2) - 4 y^2 x}.$$

And now equating this value of $\frac{\dot{y}}{\dot{x}}$ with the foregoing, there

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there is obtained

$$\frac{2y(a^2 + y^2)}{2x(a^2 + y^2) - 4y^3x} = \frac{a^2 + y^2}{2yx}$$

or, $4y^2x = 2x(a^2 + y^2) - 4y^3x$, or $4y^2 = a^2 + y^2$; whence $y = a\sqrt{\frac{1}{3}}$; which being substituted in the original equation, gives $x = \frac{2}{3}a$; which are therefore the values of x and y answering to the required point of inflection.

At present we have only considered those curves that have parallel ordinates, and which are referred to one common axis; but it is necessary to employ a different method when the curves are referred to a common focus; it will therefore be proper now to attend to this latter case, observing only, with regard to the former, that in order to know whether any curve be concave or convex towards any point assigned in the axis, find the value of \dot{y} at that point; then if this value be positive, that curve will be convex towards the axis, and if it be negative, it will be concave. The rule for determining the points of contrary flexure and retrogression of curves, which supposes the second fluxion of the ordinate to be nothing or infinite, i. e. $\ddot{y} = 0$ or ∞ , is liable to several exceptions, as is shewn very fully and clearly by Maclaurin in his Treatise of Fluxions, book i. chap. 9. book ii. chap. 5. art. 866 and 867.

The ordinate y passes through a point of contrary flexure when, the curve being continued on both sides of the ordinate, is a maximum or minimum. But this does not always happen when $\ddot{y} = 0$, or ∞ . Maclaurin observes, in general, that if \ddot{y} , $\ddot{\dot{y}}$, $\ddot{\ddot{y}}$, &c. vanish, the number of these fluxions being odd, and the fluxions of the next order to them having a real and finite value, then y passes through a point of contrary flexure; but if the number of these fluxions that vanish be even, it cannot be said to pass through such a point; unless it should be allowed that a double infinitely small flexure can be formed at one point.

The curve being supposed to be continued from the ordinate y , on both sides, if \ddot{y} be infinite, the extremity of the ordinate is not therefore always a point of contrary flexure, as \dot{y} is not always, in this case, a maximum or minimum; and the curve may have its concavity turned the same way on both sides of the ordinate. But these cases may be distinguished by comparing the signs of \ddot{y} on the different sides of the ordinate; for when these signs are different, the extremity of y meeting the curve is a point of contrary flexure.

The suppositions of $\dot{y} = 0$, or ∞ , and of $\ddot{y} = 0$, or ∞ , serve to direct us where we are to search for the maxima and minima, and for points of contrary flexure; but we are not always sure of finding them. For though an ordinate or fluxion that is positive, never becomes negative at once, but by increasing and decreasing gradually, yet after it has decreased till it vanish, it may thereafter increase, continuing still positive; or after increasing till it becomes infinite, it may thereafter decrease without changing its sign.

Of the points of inflection and retrogression of curves referred to a common focus.

Let ADE (figs. 4. and 5.) represent a curve referred to the focus Q, from whence the ordinates QD, QD proceed; and let Qd be indefinitely near to QD. Draw QT perpendicular to QD, and Qt perpendicular to Qd. Draw D'T a tangent to the point D, and dt a tangent in the point d. Let Qt (produced if necessary) meet D'T in the point o. Now it is plain, that as the ordinates increase, if the curve be concave towards the focus Q (fig. 4.),

Qt will be greater than QT; but if the curve be convex towards the focus Q (fig. 5.) Qt will be less than QT; and therefore, as the curve changes from being concave to convex, or *vice versa*, that is, in the point of inflection, or retrogression, the line or quantity ot, from being positive, ought to become negative, or the contrary; and therefore must pass through nothing or infinity.

Therefore make QD = y , DM = \dot{x} , and with the centre Q, let the indefinitely small arcs DM, TH, be described: then the two triangles dMD, dQT will be similar, as also dQo, THo, and therefore it will be $dM : MD :: dQ$ (or DQ) : QT, or $\dot{y} : \dot{x} :: y : \frac{\dot{x}y}{\dot{y}} = QT$.

But the two sectors DQM, TQH are also similar; whence

$$DQ : DM :: QT : TH, \text{ or } y : \dot{x} :: \frac{y\dot{x}}{\dot{y}} : \frac{\dot{x}\dot{x}}{\dot{y}} = TH;$$

and because of the similar triangles dQo, and THo, it will be dQ (or DQ) : Qo (or QT) :: TH : Ho; that is, $y : \frac{y\dot{x}}{\dot{y}} :: \frac{\dot{x}^2}{\dot{y}} : \frac{\dot{x}}{\dot{y}^2} = Ho$. But Ht (fig. 3.) re-

presents the fluxion of QT, that is, $Ht = \frac{\dot{x}\dot{y}^2 - y\dot{x}\ddot{y}}{\dot{y}^2}$

by taking \dot{x} as constant. Therefore $to = tH + Ho = \frac{\dot{x}\dot{y}^2 - y\dot{x}\ddot{y} + \dot{x}^2}{\dot{y}^2}$, which must be equal to 0, or to ∞ , infinity; and consequently multiplying by \dot{y}^2 , and dividing by \dot{x} , it will be $\dot{y}^2 - y\ddot{y} + x = 0$, or ∞ .

In fig. 4. ot becomes negative, and therefore $ot = -\frac{\dot{x}\dot{y}^2 + y\dot{x}\ddot{y} - \dot{x}^2}{\dot{y}^2}$, and multiplying and dividing this expression as above, we have again

$$\dot{y}^2 - y\ddot{y} + x = 0, \text{ or } \infty,$$

which therefore is the general formula for finding the point of inflection or retrogression in curves that are referred to a focus.

Let us now make an application of this formula to an example, by proposing to find the point of contrary flexure in the curve, which is generated as follows:

AED being a circle described from the centre B, let AFK be such a curve, that, drawing any radius BFE, the square of FE may be always equal to the rectangle of the corresponding arc AE, into a right line b . See fig. 6.

Let the arc AE = z , BA = BE = a , BF = y , and FG = \dot{x} , drawing BE' indefinitely near to BE, and with the centre B, and radius BF describe the small arc FG; then by the nature of the curve, it will be $bz = a^2 - 2ay + y^2$; and taking the fluxions we have $b\dot{z} = -2a\dot{y} + 2y\dot{y}$,

whence $\dot{z} = \frac{2y\dot{y} - 2a\dot{y}}{b} = BE'$. But because of the

similar-sectors BEE', and BFG, it will be as BE : BF ::

E'E' : FG; that is, $a : y :: \frac{2y\dot{y} - 2a\dot{y}}{b} : \dot{x}$; whence

$$\dot{x} = \frac{2y^2\dot{y} - 2ay\dot{y}}{ab}; \text{ and now taking the fluxions again}$$

and making \dot{x} constant, we have $4y\dot{y}^2 + 2y^2\ddot{y} - 2a\dot{y}^2 - 2ay\ddot{y} = 0$; therefore $y\ddot{y} = \frac{a\dot{y}^2 - 2y\dot{y}^2}{y - a}$.

Now the general formula above is $\dot{x}^2 + \dot{y}^2 - y\ddot{y} = 0$, and therefore substituting for these quantities their respective values, the expression becomes

$$\frac{4 y^4 \dot{y}^2 - 8 a y^3 \dot{y}^2 + 4 a^2 y^2 \dot{y}^2 + a^2 b^2 \dot{y}^2}{a b^2} -$$

$$\frac{a \dot{y}^2 - 2 y \dot{y}^2}{y - a} = 0, \text{ and these again reduced to a common denominator will be}$$

$$\frac{4 y^5 - 12 a y^4 + 12 a^2 y^3 - 4 a^3 y^2 + 3 a^2 b^2 y - 2 a^3 b^2}{a b^2 (y - a)}$$

= 0, or ∞ ; the roots of which equations will give those values of y , or of B F, that answer to so many different points of contrary flexure. In general the number of roots in the finite equation always indicate the number of points of inflection or retrogression belonging to the curve which is the subject of investigation; and consequently, in those curves that have but one such point, it is determined by a simple equation.

Curves may also have another kind of retrogression different from that we have been considering; which is, when the curve returns backwards towards its origin, turning its cavity the same way that it did before its retrogression, as in the following case.

Let the curve be B A C (fig. 7.), with a contrary flexure at A, and let it be evolved by a thread beginning at any point D, different from the point of contrary flexure A: the evolution of the portion D C generates the curve D G, and that of the portion A B generates the curve E F; in such manner that the evolution of the whole curve B A C will form the entire curve F E D G, which has two retrogressions, one at D of the usual form, because the two branches D E, D G, turn their convexity; the other at E of the second sort, because the branches E D, E F, are concave towards the same parts. Let now $m N$, $N n m$, be any two radii, indefinitely near, of the evolute D A; and $N H$, and $n H$, two perpendiculars to the same; the two indefinitely small sectors $N m M$, $H N n$, will be similar, and therefore $H N : N M :: N n : M m$. But in the point of contrary flexure A, the radius $H N$ ought to be either infinite, or nothing; and the radius $N m$, which becomes A E, continues finite. Therefore, in the case of contrary flexure A, that is, the point of retrogression E, of the second sort, the ratio of $N n$, $M m$, or the ratio of the fluxion of the radius $M N$, to the element of the curve, ought to be either infinitely great, or infinitely

small. But the formula of the radius $M N$ is $\frac{(\dot{x}^2 + \dot{y}^2)^{\frac{3}{2}}}{-\dot{x}\dot{y}}$, considering \dot{x} as constant; the fluxion of which is

$$-3\dot{x}\dot{y}\dot{y}^2 \sqrt{(\dot{x}^2 + \dot{y}^2)} + \dot{x}\dot{y}(\dot{x}^2 + \dot{y}^2)^{\frac{3}{2}}$$

$$\text{and } M m = \sqrt{(\dot{x}^2 + \dot{y}^2)}; \text{ therefore } \frac{N n}{M m} = \frac{\dot{x}^2 \dot{y} + \dot{y}^2 \dot{y} - 3\dot{y}\dot{y}^2}{\dot{x}\dot{y}^2} = 0, \text{ or } \infty;$$

which is the formula for points of retrogression of the second order.

For other methods of finding the points of inflection and retrogression of curves, the reader is referred to Simpson's and Maclaurin's Fluxions; Donna Agnesi's Analytical Institutions; and to the *Traité Elementaire de Calcul Differentiel*, par La Croix.

INFLORESCENCE, in *Botanical Phraseology*, *inflorescentia* of Linnæus, is used to express the particular manner in which flowers are disposed upon a plant, and which preceding writers denominated the *modus florendi*, or "manner of flowering." The several kinds of inflorescence come under the heads of *Verticillus*, *Racemus*, *Spica*, *Corymbus*,

Fasciculus, *Capitulum*, *Umbella*, *Cyma*, *Panicula* and *Thyrusus*, which the reader will find in their proper places. A slight correction of the definition which stands under our article CAPITULUM is necessary, the *Statice Armeria* or Thrift, and *Gomphrena globosa* or Globe amaranthus, being better examples of that kind of inflorescence than any compound flower.

For the reasons against taking generic characters from the inflorescence, see CYME and GENUS.

INFLUENCE, a quality supposed to flow from the bodies of the stars, either with their heat or light, to which astrologers vainly attribute all the events which happen on the earth.

Alchemists, also, who to this ascribe the philosopher's stone, tell us that every thing in nature is produced by the influences of the stars, which, in their passage through the atmosphere, imbibe many of its moist parts, the grossest whereof they deposit in the sands and earths where they fall; that these, filtrating through the pores of the earth, descend even to the centre, whence they are driven, by the central fire, back again to the surface; and in their ascent, by a natural kind of sublimation, as they find earths duly disposed, they form natural bodies, as metals, minerals and vegetables, &c. Thus it is pretended, that chemistry, consisting of an artificial imitation of these natural operations, and in applying active principles to passive principles, can form natural bodies, make gold, &c. See TRANSMUTATION, and PHILOSOPHER'S STONE.

INFLUENT, a term used where a liquor or juice, by the contrivance of nature, and the laws of circulation, falls into a current or receptacle.

Thus with respect to the common receptacle, the chyle is its influent juice; and so is the bile to the gall-bladder; the venal blood to the heart in its diastole; and the like.

INFLUENZA, in *Medicine*, a term generally employed to denote an *epidemic catarrh*, which has at different times spread more rapidly and extensively than any other epidemic disorder. For it has seldom occurred in any one country of Europe without appearing successively in every other part of it; it has sometimes apparently traversed the whole of the old world; and, in some instances, it has been even transferred to America, and has spread itself over that continent likewise. The French give it the name of *La Grippe*.

In truth, this extensive prevalence of the disease constitutes its most remarkable peculiarity: for in all the instances of its occurrence, from the fourteenth century down to the present day, its phenomena have not only been pretty uniformly the same, but have differed little, except in severity, from those of the common febrile catarrh. (See CATARRH.) This will appear from the following description of the disease, when epidemic in 1782, which is taken from a comprehensive view of it, compiled by the late Dr. Gray, of the British Museum, from a number of accounts given by physicians, in various parts of Great Britain, from their own personal observation (see Medical Communications, vol. i. art. 1. Lond. 1784); and from a similar account published by the College of Physicians. Med. Transactions, vol. iii. art. 8.

Very little authentic information was procured respecting the history of this epidemic, before the time of its appearance in London: all that was stated, on good authority, was, that it prevailed at Moscow in the months of December 1781, and January 1782, and at Peterburgh in February 1782; and it was traced to Tobolski, to which place it was supposed to have been brought from China. In confirmation of this opinion it was observed, that several accounts from different parts of the East Indies made mention of a disorder, similar in its symptoms, which prevailed in those parts in the months

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months of October and November 1781. At all events, its course was in the beginning westward; for it was in Denmark in the latter end of April 1782, or the beginning of May; and many people were said to have died of it at Copenhagen before the 11th of May. It appeared at Newcastle-upon-Tyne about the end of April, and in the second week in May it was certainly in London; some persons indeed thought that it had reached the metropolis sooner. According to the accounts received from various parts of England, it did not begin to appear in most of them until after its prevalence in London, namely, until the latter end of May, or the beginning of June. In Scotland and Ireland it seems to have been rather later, and in the south of Europe later still; for it prevailed in France in the months of June and July; in Italy, in July and August; and in Portugal and Spain, in August and September. The fourth week in May was the period of its most general prevalence in London: from that time it began to decline, and in the space of two or three weeks ceased to exist as a general disorder; but it did not altogether leave the city till the month of September.

No attempt was made to ascertain with accuracy the proportional number of persons attacked by this influenza: the number was every where very great; the proportion of the inhabitants affected in some places being estimated at three-fourths, in other places at four-fifths of the whole: and in London it was asserted, from a pretty competent view of the matter, that the number of those attacked by it was much greater than that of those who escaped it. Both sexes appeared to be equally liable to it; but persons of the middle age were more subject to its attacks than old people, and these more than children; while infants were considerably less pre-disposed to it than either, though not entirely exempt from it. When old persons were attacked, they generally had the disease very violently.

This epidemic appeared with a considerable variety of symptoms; but the most general form of it was certainly that of catarrh; and the great debility or depression of strength which accompanied its attack, and the rapidity with which its symptoms came on, (which in some instances was truly wonderful,) seem to have been the most remarkable characters of it. Persons, apparently in perfect health, were seized instantaneously, as it were, with a violent cold, to which succeeded head-ache, running at the nose, &c.; while others were as suddenly seized with giddiness, stricture on the chest, sickness at the stomach, and cold sweats, which were speedily followed by the pectoral symptoms. The most common course of the symptoms, however, was the following:

The disease generally began with fits of chilliness and heat alternately succeeding each other; sometimes with a slight shivering, followed by more or less of fever; anxiety of the præcordia; pain in the back and limbs; stitches and cramps in the muscles subservient to respiration; a very great discharge of their lymph from the eyes and nose; a sensation in the eyes as if they were about to start out of the head; sneezing, hoarseness, and frequently an incessant cough, forcing up large quantities of mucus, and sometimes attended with a soreness of the breast. In many instances the appetite and sense of taste were lost or much impaired, with some degree of nausea; and a few vomited. Most of the patients laboured under great lassitude and restlessness. The sleep was generally much broken; and many could hardly sleep at all. The pulse was frequent, but seldom hard or tense. Languor, debility, and dejection of spirits were general, and very great in all; far beyond what might have been expected from the degree of all the other symptoms.

But the symptom which universally prevailed, and which appeared to be almost a pathognomonic of the disease, was a distressing pain and sense of constriction in the forehead, temples, and sometimes in the whole face, accompanied with a sense of soreness about the cheek-bones under the muscles. This, now and then, was felt previously to the catarrh, and not unfrequently was followed by very little or no catarrhus affection.

The distemper was by no means so uniform as to present the same identical appearances in every subject whom it attacked; nor yet so various, but that the resemblance could easily be discovered; diversified perhaps by the peculiar habit and constitution of the sufferer, or by some other circumstances not easily explained. In some, a part only of the mucous membrane was affected, in others the whole. In the latter, a soreness of the throat was common, with frequent excretion. Upon inspecting the *fauces* of these, a redness might be observed; but in few instances any considerable swelling, and in none any ulceration. In some there was a great propensity to perspiration; it could be readily excited in most, and often appeared where no means had been employed for that purpose; but in a few the skin was dry throughout the whole complaint. Daily exacerbations and remissions of the cough and fever were obvious in many instances; in some, they either did not take place, or if they did, were very obscure. The state of the belly was very different in different patients; in some it was regular, in others disposed to costiveness; which, however, was easily removed: and several had a spontaneous purging at various periods of the disease, sometimes with pain, but oftener without. Nothing in general could be collected from the urine that deserves notice.

These were the most general and frequent appearances of the influenza of 1782. But it must be observed, that not only in London, but in all parts of the island from whence accounts were received, it now and then degenerated into pleurisy or peripneumony; yet these affections still manifested themselves as particular modifications of the epidemic, being either preceded or accompanied by some of its characteristic symptoms. Some, thus attacked, had in the beginning either that distinguishing pain in the face and forehead, or catarrh, or both: and in all there was that debility of body and depression of mind, which are not essential to inflammation; the presence of which here, however, was obvious and indisputable.

The rarer occurrences were in some few an unusual disposition to sleep; in others, strangury independent of blisters, and in some instances attended with bloody urine for three or four days; hæmorrhages from the nose, with relief to the catarrhal affections; and one instance of a clear discharge from the ears, as copious as others had it from the nose.

Extensive as the range of this epidemic was, its influence was neither very fatally exerted, nor long continued. Very few died of it; and of those to whom it proved fatal, the greater part were old, asthmatic, or had been debilitated by some previous indisposition. The continuance of the distemper in any one place was not above six weeks: where it appeared in May, it vanished before the end of June; and where it did not break out before June, it remained until the middle, or towards the decline of July. Its duration with each individual whom it attacked was as various as the degree of violence with which the attack was made. It seldom held any one above a fortnight; in some its duration was not above a day or two; but it usually lasted about a week, or longer. In some parts of the country relapses were common a second, third, or even fourth time; this was also the case in London, but to a less extent. The cough was sometimes

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times troublesome for a considerable time after the febrile state of the disorder had ceased; and a great weakness often remained after the disease.

The influenza, as above described, may be taken as an example of the epidemic at all times of its appearance; but it has sometimes assumed a more violent and inflammatory type, been more frequently accompanied with symptoms of pleurisy and peripneumony, and therefore more frequently fatal, and also laid the foundation for more numerous cases of pulmonary consumption, than in the instance of 1782. Such was the fact, in regard to the influenza of 1762 in particular; which, indeed, appeared to be far more fatal, both at the time of its raging, and in its consequences, as several persons continued languishing under the remains of it for one or two years, and never recovered.

The causes of the influenza have been the subject of much difference of opinion; and all that has been said in respect to them rather tends to prove the difficulty of obtaining a sufficient number of unquestionable facts to found a clear opinion upon, than to set the subject at rest. Three different views of the matter have been taken by different physicians: 1. Some attributed the disease solely to the state of the weather; *i. e.* they believed it to be a common catarrh, occasioned by changes in the sensible qualities of the atmosphere, such as cold, moisture, &c.: 2. Others ascribed it to a particular and specific morbid principle, totally different from and independent of the sensible qualities of the atmosphere, but resident in and conveyed by the air: 3. While the greatest number concurred in the opinion, that the influenza was contagious, in the ordinary acceptation of the word, *i. e.* was propagated only by the contact, or at least by the sufficiently near approach, of an infected person. The first opinion, however, that it originated in the sensible variations of the air, seems to be untenable: for not only was there no peculiarity of the atmospheric temperature, moisture, &c., which was common to the different periods when the influenza prevailed, or was obviously different from that of other seasons, when it had not appeared; but the sensible state of the air preceding and accompanying the same epidemic was different in different places. Thus, though in most parts of England it had been uncommonly cold and wet, yet in the other parts of the world, as in Germany, where the disorder was equally general, it had been very dry. Again, it was observed in several places, that great alterations happened in the weather during its prevalence, without any sensible change in the symptoms of the disorder.

The second opinion, that the cause of the disease, though not connected with the sensible qualities of the atmosphere, was yet resident in it, and thus conveyed from place to place, was supported upon the following grounds: 1st. That those who were most exposed to the air were generally the first persons attacked: 2dly. That many had the disorder without having had any communication with a diseased person: 3dly. That several escaped though surrounded by persons ill of the disease: 4thly. That some whole families were seized at once: and, 5thly. That some persons had the disorder a week or a fortnight before it began to be taken notice of as a general one. Without presuming to decide upon so difficult and intricate a question, we may state the following objections to these arguments.

The first argument, that those who were most exposed to the air were generally the first persons attacked, (which, by the way, was altogether denied by many observers,) is surely by no means in favour of the opinion, that the cause of the disorder resided in the atmosphere; for if it had resided there, what should have prevented those who staid at home

from being infected? since the air which they breathed must necessarily have been the same as that breathed by those who went out. But if, on the other hand, a communication with some infected person was necessary to produce the disorder, it is very clear that those who went out of doors, and mixed with the world, were more likely to get it than those who did not stir from home.

Before the second argument, namely, that many were attacked without having had any communication with a diseased person, can be allowed to have any weight, it must be clearly proved, not only that the persons themselves had not had such communication, but also, that no person, who had been near them, had previously been where the disorder existed: for it is pretty clearly established, with respect to other active contagions, such as the small-pox, &c. that a person, who has already suffered the disease, may nevertheless convey the contagion from one place to another.

From the third argument, that many escaped though surrounded by persons affected with the disease, no inference of any consequence to the present question can be drawn; it being certainly not less difficult to account for their escape when surrounded by diseased persons, than when surrounded by the same air, which had (according to the hypothesis) caused the disease in those persons.

With respect to the fourth argument, that some whole families were seized at once, without having been exposed to infection, it may be remarked that, when we consider what has been said in answer to the second argument, it will be very difficult to prove that they were not exposed to it; and equally difficult to give any reasons why, if the exciting cause of the disorder resided in the air, any whole family should have been affected by that cause, rather than an equal number of persons in divers families; but if we suppose the disease to have been propagated by personal intercourse, it is very easy to conceive in what manner it may have been communicated to some whole families at the same time. And, in answer to the last argument, that some persons had the disorder a week or a fortnight before any others were known to have it, it may be sufficient to remark, that, admitting these cases to have been really influenza, the supposition, that the cause of it existed in the air, will not render it more easy to explain why those persons only should at that time have been affected by this cause.

These considerations tend to favour the third opinion above-mentioned, that the disease was propagated by contagion, in the common acceptation of the term, that is, by personal communication with the diseased; but they are very far from being decisive of the question. Indeed, the question of contagion, as connected with any particular epidemic, in which there is no palpable matter produced, by which the disease can be communicated, is always difficult, and has been agitated even with regard to the plague itself. (See CONTAGION and EPIDEMIC.) But it has been satisfactorily demonstrated, that the contagion of all malignant and eruptive fevers cannot be conveyed through the air to any distance (even many feet) from its source. If the contagion of the influenza, therefore, could be suspended and conveyed through the atmospheric air, so as to spread the disease far and wide, it would form an exception to the general properties of known contagions. Several facts, recorded during the epidemic of 1782, militate strongly against such a supposition. It was remarked, for example, that the disease was prevalent in one place a week or two before it appeared in another, only a few miles distant from the first. Thus it shewed itself at Edinburgh on the 20th of May, and soon raged very much, and was prevalent at Glasgow in the first week in June; yet it did not appear at Musselburgh, a village

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village about five miles south-east of Edinburgh, until the 9th or 10th of June. Again, it was prevalent at Dartmouth much sooner than at Exeter, and yet it appeared at Exeter much sooner than at Tinnmouth, although the last mentioned place is situated between Dartmouth and Exeter.

The opinion, that it was propagated by personal intercourse, was also favoured by its progress in numerous instances. Thus it was frequently observed, that some one individual in a family was first attacked, and that then several more, and sometimes the whole of the same family, were very soon afterwards seized with it, in some instances all at once, but in others successively. Very early in June, three families, consisting of seventeen persons, came on the same day to the hotel in the Adelphi buildings; they were all in perfect health when they arrived; and they were all affected the next day with the symptoms of the illness then reigning in London. In some cases, it seemed to be propagated, like contagious diseases in general, by *fomites*, that is, by articles of clothing or furniture impregnated with the morbid effluvia. One physician, Dr. Mease of Strabane, in Ireland, says, "I have no shadow of doubt that the disorder was contagious; and am certain, I myself received the infection from a small trunk of wearing apparel, which came from Dublin, where it then raged. I may add, that this was the first introduction of it into this town." The disease appeared to be carried on board two ships of war, on their arrival at Gravesend from the West Indies, by three custom-house officers, who were put on board: in a few hours after, the crews of both ships, till then in good health, were seized with symptoms of the influenza; hardly a man in either ship escaped, and some had it very severely. In some instances it was observed, that the epidemic did not shew itself in certain places, until some one or more arrived at those places, either actually labouring under the disease, or coming immediately from other places, whose inhabitants had been affected by it for some days. In general the disease appeared earlier in towns, than it did in the surrounding villages, and in villages earlier than in the detached houses in the neighbourhood.

On the whole, the progress of the disorder is perhaps more easily explained, upon the supposition that it was propagated by personal communication, than by any other. In objection to this hypothesis, however, it is credibly affirmed, that the crews of several ships were seized with the influenza many miles distant from land, and came into various ports of England labouring under it; and the same thing is said to have happened to ships in the East Indies, and other parts. But great caution is requisite in admitting such statements as facts, from which any satisfactory inferences can be deduced.

A similar epidemic catarrh, or influenza, is recorded as having visited Europe, and even other parts of the globe, two or three times in the fourteenth century, and at several subsequent periods; namely, in the year 1510, 1575, and 1580, the last of which is said to have originated, like several of those which succeeded, in Asia; and again in 1591, in 1658, in 1675, in 1709, in the latter end of 1732, and in the beginning of 1733, in 1743, in 1748, in 1762, in 1767, in 1775, in 1782, and in 1803. Those who are desirous of investigating the records of these epidemics, will find references to the works in which they are contained, arranged in chronological order, in Dr. Cullen's *Synopsis Nosologiæ Method.* under the head of Catarrhus, Gen. xl. and species 2. C. à contagio.

Cure of the Influenza.—Since the effects of this disease

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were different in different individuals, no general method of cure could rationally be followed. Many, indeed, were so slightly indisposed, as to require but little or no medicine. Nothing more was wanted for their cure, than to abstain for two or three days from animal food and fermented liquors, and to use some diluting tepid drink. A lenient purgative, given at the beginning of the disease, was useful in moderating the fever; and nature sometimes seemed to point out the repetition of it afterwards, when there were pains in the stomach and bowels, and a tendency to a diarrhœa. The same was observed in the epidemics of 1732 and 1762. Nothing likewise was observed so successfully to mitigate the cough, as to open the bowels with a gentle purgative, and afterwards to give a slight opiate at night. It was observed by numerous practitioners, that emetics, exhibited upon the first attack, were evidently of use in relieving the head and breast, and also in producing a speedy and free perspiration. All attempts to force much sweating appeared to do harm, especially by means of the stimulating diaphoretics, such as contrayerva, ammonia, wine whey, &c. In fact, in most of the mild and simpler forms of the disease, an early perspiration generally came on spontaneously, which seldom failed to relieve the symptoms materially, and it was only necessary to give tepid aqueous liquors, the neutral salts, or antimonials in small doses, to keep up a regular and gentle moisture upon the skin.

But in the more severe forms of the disorder, other remedies became necessary, according to the severity of the symptoms. Whenever symptoms of pleurisy or peripneumony appeared, the propriety of blood-letting was commonly admitted, notwithstanding the languor and depression connected with the disease. There was, however, considerable difference of opinion upon the subject of blood-letting. Several learned and experienced physicians, if called at the beginning of the disease to a person strong and plethoric, and labouring under great heat and inquietude, even in cases where no direct symptoms of pneumonic inflammation appeared, ordered bleeding without hesitation; and under such circumstances, they several times observed, that the languor, oppression, and feverish anxiety, were abated by the loss of a few ounces of blood; that both the head and the breast were relieved; and that the disease proceeded to its termination with fewer difficulties both to the patients and to themselves, and without any subsequent inconvenience. Yet others were of opinion that the blood-letting, although indicated by the symptoms, and also by the appearance of the blood drawn, not only failed to procure that relief, which might have been expected from it under ordinary catarrhal or pneumonic symptoms, but in some cases even proved prejudicial. Blisters were applied to various parts with good effects: when there was pain in the breast or side, the application of them to the part affected was found very beneficial; and it was frequently thought proper to keep them open for some time. In some cases, it was remarked, that a second blister, applied a few days after the first, produced great relief, when the first had failed to do so. On account of the great debility, which seldom failed to accompany or follow the disorder, bark and cordials were often deemed necessary, especially towards the close of the disease; but they would probably be deemed less necessary by the practitioners of the present day; for when a diseased condition is removed, the constitution commonly recovers its strength with rapidity, when care is taken the food be light and nutritious, and there is a free access to pure air. See Medical Transact. vol. iii. art. 8.—Medical Communications, vol. i. art. 1.—Hist. de la Soc.

Royale de Med. de Paris, pour 1776.—Edin. Med. Essays, vol. ii. art. 2.—Rutty, Hist. of Weather.

INFORCED.

INFORCEMENT.

IN FORMA PAUPERIS, in *Law*. See *FORMA Pauperis*.

INFORMATION, for the king, is much the same with what is called declaration for a common person: it is not always done directly by the king or his attorney, or the clerk of the crown-office; but sometimes by another, who sues as well for the king as himself, on a breach of some penal law or statute, wherein a penalty is given, one part to the use of the king, and another to the use of the informer. And it differs from an indictment, which is found by the oaths of twelve men; and is only the allegation of the officer who exhibits it. The latter sort of informations, which are partly at the suit of the king, and partly at that of a subject, is a species of *qui tam* actions, so called because they are brought by a person *qui tam pro domino rege, &c. quam pro seipso in hac parte sequitur*, and carried on by a criminal instead of a civil process. By 31 Eliz. c. 5, no prosecution of this kind can be brought by any common informer, after one year is expired since the commission of the offence; nor out of the country where the offence was committed; nor on behalf of the crown after the lapse of two years longer; nor, where the forfeiture is originally given to the king alone, can such prosecution be had after the expiration of two years from the commission of the offence. It is also enacted by 18 Eliz. c. 5, that if any person, informing under pretence of any penal law, makes any composition without leave of the court, or takes any money or promise from the defendant to excuse him, he shall forfeit ten pounds, stand two hours on the pillory, and be for ever disabled to sue on any popular or penal statute. And by the same statute, if a person exhibits his information only for vexation, the defendant may bring information against the informer. See *COMPOUNDING of Informations*.

Informations that are exhibited in the name of the king alone are of two kinds; those which are truly and properly his own suits, and filed *ex officio* by his own immediate officer, the attorney-general; and those, in which, though the king is the nominal prosecutor, yet it is at the relation of some private person or common informer; and they are filed by the king's coroner and attorney in the court of king's bench, usually called the master of the crown-office, who, for this purpose, is the standing officer of the public. The objects of the king's own prosecutions, filed *ex officio* by his own attorney-general, are properly such enormous misdemeanors as particularly tend to disturb or endanger his government, or to molest or affront him in the regular discharge of his royal functions. The objects of the other species of information are any gross and notorious misdemeanors, riots, batteries, libels, and other immoralities of an atrocious kind. And when an information is filed in either of these ways, it must be tried by a petit jury of the county where the offence arises; after which, if the defendant be found guilty, he must be referred to the court for his punishment. These informations, which are as ancient as the law itself (1 Show. 118.), of every kind, are confined by the constitutional law to mere misdemeanors only, without extending to any capital offence. The oppressive use of information by the court of Star-chamber, &c. in the times preceding the Revolution, occasioned a struggle soon after the accession of king William, to procure a declaration of their illegality by the judgment of the court of king's bench. But Sir John Holt, who then presided there, and all the judges,

were clearly of opinion, that this proceeding was founded on the common law, and could not then be impeached. However, in a few years afterwards, it was enacted by 4 & 5 W. & M. c. 18. that the clerk of the crown shall not file any information without express direction from the court of king's bench; and that every prosecutor, permitted to promote such information, shall give security by a recognizance of twenty pounds (a sum now too small), to prosecute the same with effect; and to pay costs to the defendant, in case of his acquittal, unless the judge, who tries the information, shall certify there was reasonable cause for filing it: and, at all events, to pay costs, unless the information shall be tried within a year after issue joined. But there is a proviso in this act, that it shall not extend to any other informations than those which are exhibited by the master of the crown office: and, consequently, informations at the king's own suit, filed by his attorney-general, are no way restrained thereby.

There is one species of informations, still farther regulated by 9 Ann. c. 20, *viz.* those in the nature of a writ of *quo warranto*, which is a remedy given to the crown against such as had usurped or intruded into any office or franchise. The modern information tends to the same purpose as the ancient writ, being generally made use of to try the civil rights of such franchises; though it is commenced in the same manner as other informations are, by leave of the court, or at the will of the attorney-general; being properly a criminal prosecution, in order to fine the defendant for his usurpation, as well as to oust him from his office; yet usually considered at present as merely a civil proceeding.

An information on behalf of the crown, filed in the exchequer by the king's attorney-general, is a method of suit for recovering money or other chattels, or for obtaining satisfaction for damages in any personal wrong committed in the lands or possessions of the crown. (Moor, 375.) The most usual informations are those of *intrusion* and *debt*; the former being for any trespass committed on the lands of the crown (Cro. Jac. 212. 1 Leon. 48. Savil. 49.), as by entering thereon without title, holding over after a lease is determined, taking the profits, cutting down timber, or the like; and the latter, upon any contract for monies due to the king, or for any forfeiture due to the crown upon the breach of a penal statute. There is also an information *in rem*, usually filed in the exchequer, where any goods are supposed to become the property of the crown, if no man appears to claim them, or to dispute the title of the king. There is also another information, filed *ex officio* by the attorney-general, in the court of chancery, at the relation of some informant, called the relator, for the proper establishment of charities, of which the king has the general superintendence. Blackst. Com. b. iii. and iv.

INFORMATUS NON SUM, or *Non sum informatus*, a formal answer made of course by an attorney, who is commanded by the court to say any thing he thinks good in behalf of his client: who having nothing material to urge, makes answer, he is not informed: on which judgment passes for the other party.

INFORMER, INFORMATOR, a person that informs against, or prosecutes in any of the king's courts, those that offend against any law or penal statute. See *INFORMATION*.

INFORMIS, UNFORMED, that which has not the form or perfection it should have.

INFORMES *Stellæ*, in *Astronomy*, are such stars as have not yet been reduced into any constellation: otherwise called *Sporades*.

Of this kind there was a great number left by the ancient astronomers ; but Hevelius, and some others of the moderns, have provided for the greater part of them, by making new constellations.

INFORTUNIUM, HOMICIDE BY. See HOMICIDE.

INFRA, *Lat. below.* See HYPO.

INFRACTION, formed from *in* and the supine of *frango*, *I break*, a rupture or violation of a treaty, law, ordinance, or the like.

INFRALAPSARII, in *Ecclesiastical History*, the name of a sect of Predestinarians, who maintain, that God has created a certain number of men only to be damned, without allowing them the means necessary to save themselves, if they would ; and they are thus called, because they hold that God's decrees were formed *infra lapsum*, after his knowledge of the fall, and in consequence thereof ; in contradistinction to the Supralapsarians.

INFRASCAPULARIS, in *Anatomy*, a name of the infra-spinatus muscle. See the following article.

INFRASPINATUS, is a muscle of the shoulder, called by the French sous-epineux, and sous-scapulo-trochitérien. It is placed at the back of the shoulder, covering that division of the dorsum of the scapula which is below the spine, and extends from the basis of the scapula to the great tubercle of the humerus. It is thick, broad, and triangular.

Its posterior surface is covered above and on the outside by the deltoid ; above and within by the trapezius, and below by the latissimus dorsi : in the rest of this surface it is covered by the skin. A thin aponeurosis, common to this muscle and the teres minor, immediately invests its posterior surface. This aponeurosis is continuous above with those of the trapezius and deltoid, it is attached on the inside to the basis of the scapula ; is continuous below, with a septum placed between the two teres muscles and the infra-spinatus ; and is fixed on the outside to the posterior edge of the inferior margin of the scapula.

Its anterior surface covers the scapula below the spine, to the posterior three-fourths of which it is attached. It is separated from the anterior fourth of this lower division of the scapula by the superior and external scapular vessels, by the scapular nerve, and by cellular substance. Beyond the scapula this surface of the muscle covers the shoulder joint, to the orbicular ligament of which it is strongly connected. The inner edge is fixed to the basis of the scapula, from the spine almost to the inferior angle. Its upper edge is attached to the lower surface of the spine of the scapula, and to the aponeurosis of the deltoid : the outer portion of this margin is parallel to the inferior edge of the supra-spinatus. The lower border is oblique from below upwards, and from within outwards. This is united to the teres major by an aponeurotic septum, which is soon divided into two layers : one of these passes between the two teres muscles, the other between the teres minor and infra-spinatus. The lower border of the latter is then united to the teres minor through about half its length ; for the rest of their extent they are separated by a cellular line. In many subjects the fibres of these two muscles are so confounded at this part, that they cannot be separated.

The superior and inferior edges are united at a truncated angle, which is large and thick, and attached to the middle of the great tubercle of the humerus.

The infra-spinatus muscle is composed of tendinous and muscular parts. It is attached to the humerus by a broad and thick tendon, which expands into an aponeurotic plane continued into the substance of the muscle beyond its middle, and nearer to the posterior than to the anterior surface of the muscle. The muscular fibres arise from the dorsum

of the scapula, from the under surface of its spine, from the aponeurosis of the deltoid, and from the aponeurotic septum, which separates this from the two teres muscles. They join the common tendon, which they accompany nearly to the humerus, pursuing, however, very different directions. The superior fibres proceed nearly horizontally from within outwards : all the others are oblique from within outwards, and from below upwards, and their obliquity increases as they are placed lower down. Those fibres, which arise from the aponeurosis of the deltoid, and from the lower surface of the spine of the scapula, descend slightly, and terminate on the posterior surface of the tendon, on which they are extended almost to its attachment to the humerus.

The motions which this muscle can produce in the humerus, differ according to the position of that bone. When the arm is hanging by the side, the humerus will be moved on its axis, so as to be turned from before outwards and backwards. If the humerus has been previously elevated, the infra-spinatus will carry it backwards. When the arm is fixed, this muscle will draw the scapula, and through it the trunk also, forwards. The strength and breadth of its tendon enable it to support the head of the humerus, and to prevent it from being thrown out of the glenoid cavity, when the arm is moved suddenly forwards.

INFULA, a name anciently given to one of the pontifical ornaments worn on the head. Festus tells us that the infule were filaments or fringes of wool, covering that part of the head where the hair grows as far as the temples, whence, on each side, hung down two strings called *vitta*, for binding it, wherewith the ancients used to adorn their priests, their victims, and even their temples. The infula was the same thing to priests that the diadem was to kings ; viz. the badge of their dignity and authority. The difference in shape between the diadem and the infula consisted in this, that the diadem was flat and broad, and the infula was rounded and twisted.

INFUMA, or DIKJESCHOET, in *Geography*, a town of Africa, in the kingdom of Anté, where the English built a fort in 1691.

INFUNDIBULA of Birds. See *Anatomy of Birds*.

INFUNDIBULIFORM FLOWERS, in *Botany*, are such as resemble the figure of a funnel ; being broad and ample at top, and contracted into a neck at bottom ; such as that of the bear's ear, or auriclea.

INFUNDIBULUM, a Latin word signifying a *funnel* ; whence divers parts in the human body, having a resemblance thereto in shape, are called by the same name.

Hence also certain parts of plants are called *infundibuliformes*.

The word *infundibulum* is also used by the metallurgic writers to signify a vessel of a conic shape, used to pour a melted metal out of the crucible into.

INFUNDIBULUM, in *Anatomy*, a small process in the brain. See BRAIN.

INFUSION, in *Pharmacy*, an operation whereby the virtues of plants, roots, and the like are drawn out by letting them steep in some convenient fluid menstruum without boiling them therein ; since boiling is found to dissipate the finer parts of many bitter and aromatic substances, without carefully extracting their medicinal principles.

Infusion is used in bodies of a lax texture, whose parts are so light as not to admit of a greater motion without hazard of flying away in vapour.

Its chief use is to communicate the virtues of bodies to

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liquors, either in order to regulate their force, or correct their ill qualities.

Some infusions are made in common water, others in wine, vinegar, milk, spirit of wine, &c. Boiling water is sometimes effused upon any substance, and allowed to stand upon it for some time. Water is also occasionally effused cold in the same manner; and in this case the specific form of cold infusion is used.

The same operation is applicable to those substances which contain any parts volatile in the heat of 212° , to the separation of more readily soluble constituent parts from those which are less so, and to the preparation of slighter impregnations than boiling for a length of time produces. The boiling temperature of the water is so soon lost in this mode of application, that even with the most delicate substances it does no injury, and it assists in loosening the texture of the vegetable, and effecting the solution much sooner than cold water alone does. Infusions are usually matters of extemporaneous prescription, and cannot generally be kept ready prepared in the shops without spoiling. Their number has been extended to most of the articles in common use, and the strength of each is accommodated to the most usual standards of practice. We shall recite some of the principal.

The *bitter infusion* is prepared by cutting the tops of the lesser centaury and chamomile flowers of each half an ounce, and the yellow rind of lemon and orange peel, of each two drams, in small pieces, and infusing them in a quart of boiling water. A tea-cupful of this infusion may be taken twice or thrice a day for indigestion, weakness of the stomach, or want of appetite.

Infusion of the Bark is made by infusing an ounce of the powder in a pint of boiling water, with the addition of four or five table-spoonfuls of brandy, for two or three days. In disorders which require the bark, a tea-cupful of this may be taken two or three times a day.

Infusion of Calumba, infusum Calumbæ, is prepared by slicing a dram of Calumba root, and macerating it for two hours in half a pint of boiling water in a covered vessel, and straining it. See COLUMBO.

Infusion of Camomile, infusum anthemidis, is made by macerating for ten minutes, in a covered vessel, two drams of camomile flowers in a pint of boiling water, and straining.

Infusion of Carduus is made by infusing an ounce of the dried leaves of carduus benedictus in a pint of common water for six hours, without heat, and then filtering the liquor through paper. This infusion, which may be flavoured at pleasure with cinnamon, or other aromatics, may be beneficially used in weaknesses of the stomach, where the common-bitters do not agree.

Infusion of Cascarella is prepared by macerating for two hours, in a covered vessel, half an ounce of Cascarella bark bruised in half a pint of boiling water, and straining. See CASCARILLA.

Infusion of Catechu is obtained by taking $2\frac{1}{2}$ drams of extract of catechu, and half a dram of bruised cinnamon bark, macerating them for an hour, in a covered vessel, in half a pint of boiling water, and straining. See CATECHU.

Infusion of Cinchona, infusum cinchonæ, is obtained by macerating for two hours, in a covered vessel, half an ounce of lance-leaved Cinchona bark in half a pint of boiling water, and straining.

Infusion of Cloves, infusum caryophyllorum, is obtained by macerating for two hours, in a covered vessel, a dram of cloves bruised in half a pint of boiling water, and straining.

Infusion of Cusparia is procured by macerating for two hours, in a covered vessel, two drams of bruised Cusparia bark in half a pint of boiling water, and straining.

Infusion of Fox-glove, infusum digitalis, is obtained by macerating for four hours, in a covered vessel, a dram of purple fox-glove leaves, dried and powdered, in half a pint of boiling water, and straining; then adding half a fluid-ounce of spirit of cinnamon. See DIGITALIS.

Infusion, Compound, of Gentian, infusum amaram simplex, P. L. 1745, is procured by macerating in a covered vessel, gentian root sliced and orange-peel dried, of each a dram, two drams of fresh lemon-peel, in twelve ounces of boiling water, and straining.

Infusion, Compound, of Horse-radish, infusum armoraciæ compositum, is procured by macerating for two hours, in a covered vessel, fresh horse-radish root sliced, and mustard seeds bruised, of each an ounce, in a pint of boiling water, and straining; then adding a fluid-ounce of compound spirit of horse-radish. An infusion for the palsy may be made by infusing horse-radish root shaved, mustard seed bruised, of each four ounces; and one ounce of the outer rind of orange-peel in two quarts of boiling water, in a close vessel for twenty-four hours. A tea-cupful of this warm stimulating medicine may be taken three or four times a day, in paralytic complaints. It excites the action of the solids, proves diuretic, and, with warmth, promotes perspiration. If two or three ounces of the dried leaves of marsh-trefoil be used instead of the mustard, we shall have the antiscorbutic infusion.

Infusion of Linseed, infusum lini, is prepared by infusing two spoonfuls of linseed, or an ounce of linseed bruised, and half an ounce of liquorice root sliced, in two pints of boiling water by the fire for four hours, and then straining off the liquor. The pectoral infusion is made by adding to these ingredients an ounce of the leaves of colt's-foot. These emollient liquors may be taken in difficulty of making water, and in coughs and other complaints of the breast.

Infusion of Quassia is obtained by macerating for two hours, in a covered vessel, a scruple of quassia-wood sliced, in half a pint of boiling water, and straining. See QUASSIA.

Infusion of Rhubarb, infusum rhei, is procured by macerating for two hours, in a covered vessel, a dram of sliced rhubarb-root in half a pint of boiling water, and straining. See RHUBARB.

Infusion of Roses, infusum rosæ, tinctura rosarum, P. L. 1718, tinctura rosarum rubrarum, P. L. 1720, is made by infusing half an ounce of the petals of red roses, dried, in $2\frac{1}{2}$ pints of boiling water; afterwards pouring in three fluid-drams of dilute sulphuric acid, and $1\frac{1}{2}$ ounce of double refined sugar. Pour the water upon the petals of the rose in a covered glass vessel; then add the acid, and macerate for half an hour. Lastly, strain the infusion, and add the sugar to it. A tea-cupful of this astringent infusion may be taken every three or four hours, in an excessive flow of the menses, vomiting of blood, and other hæmorrhages. It will likewise serve as a very good gargle.

Infusion of Senna, infusum Sennæ, is prepared by macerating for an hour, in a covered vessel, $1\frac{1}{2}$ ounce of Senna leaves, a dram of sliced ginger-root, in a pint of boiling water, and straining the liquor. An infusion of Senna, named "infusum Sennæ tartarizatum," may be had by adding extemporaneously to each pint of the infusion two drams of supertartrate of potash, in such proportions as circumstances may require.

Infusion

Infusion of Senna and Tamarinds, is prepared by infusing for four or five hours one ounce of tamarinds and senna, and crystals of tartar, of each two drams, in a pint of boiling water; straining the liquor, and adding to it an ounce or two of the aromatic tincture. Persons who are easily purged, may leave out either the tamarinds or the crystals of tartar. A tea-cupful of this agreeable cooling-purge may be taken every half hour till it operates.

Infusion of Simarouba is made by macerating for two hours, in a covered vessel, half a dram of Simarouba bark, bruised, in half a pint of boiling water, and straining. See SIMAROUBA.

Infusion, Spanish, is made by infusing an ounce of Spanish juice cut into small pieces, and three drams of salt of tartar in a quart of boiling water for a night; and adding to the strained liquor an ounce and a half of the syrup of poppies. In recent colds, coughs, and obstructions of the breast, a tea-cupful of this infusion may be taken with advantage three or four times a day. See LIQUORICE.

Infusion of Tobacco, infusum tabaci, is made by macerating for an hour, in a covered vessel, a dram of tobacco leaves in a pint of boiling water, and straining. This infusion is intended to be used as a clyster, to which purpose it is often directed.

INFUSION is also used to signify the action of conveying liquor into the body by the veins. See INJECTION.

Some physicians have found out a new method of purging, by infusing a cathartic into the veins, which operates pretty much after the manner of a clyster.

ING, in *Agriculture*, a provincial term, employed to signify a common pasture or meadow which lies low or wet, and which is chiefly employed as hay lands.

INGA, in *Botany*. See MIMOSA.

INGANNO, *Ital.* a trick, a disappointment, a disappointed cadence, or close, is, when, after preparing for a regular termination, some unexpected chord or modulation occurs to lengthen the movement and postpone the cadence. See CADENCE.

INGARD-POINT, in *Geography*, a cape of Ireland, on the fourth coast of the county of Wexford, within which lies the small dry harbour of Feathard, which is only fit for small vessels.

INGARYD, a town of Sweden, in the province of Smaland; five miles S. of Jonkiöping.

INGATESTONE, a small town in the hundred of Chelmsford and county of Essex, England, is situated 23 miles from London, on the high road to Colchester. It consists principally of one street, and contained, according to the late return to parliament, 120 houses and 645 inhabitants. In the church, which has a high embattled brick tower, are several elaborate monuments of the Petre family, whose burial place adjoins the chancel on the north side. A considerable market was formerly held here, but having greatly declined, it has been for several years wholly discontinued; but a very large fair for Scotch and Welch cattle is still held on the first of December, annually. An alms-house, for seven women and three men, was founded, in the year 1557, by sir William Petre, and endowed by him to the amount of 90*l.* 13*s.* 4*d.* per annum.

Near the town is Ingatstone-hall, a venerable, but irregular structure, which was the family residence of the lords Petre, previous to the building of a new mansion at West Thorndon. Beauties of England and Wales, vol. v.

INGATORP, a town of Sweden, in the province of Smaland; 40 miles N. of Wexio.

INGELFINGEN, a town of Germany, in the princi-

pality of Hohenloe, on the Kocher; eight miles N. E. of Ohrenburg.

INGELHEIM, OBER, a town of France, in the department of Mont Tonnerre, situated on the Selz; 12 miles W. of Mentz. N. lat. 49° 56'. E. long. 8° 1'.

INGELHEIM, NIDER, a town of France, in the department of Mont Tonnerre, one mile from Ingelheim Ober.

INGELLY, a town of Hindooistan, in Bengal, at the mouth of the Hoogly; 60 miles S. of Calcutta.

INGELMUNSTER, a town of France, with a castle, in the department of the Lys, and chief place of a canton, in the district of Courtray; five miles N. of Courtray. The town contains 4873, and the canton 14,284 inhabitants, on a territory of 52½ kilometres in four communes.

INGELSBURG, a town of Saxony, in the Vogtland; nine miles S.S.E. of Oelsnitz.

INGELSTAD, a town of Sweden, in the province of Smaland; 10 miles S.E. of Wexio.

INGEMINATED FLOWERS, are those where one flower stands on, or naturally grows out of another; called also proliferous flowers.

INGEN, in *Geography*, a small island in the North sea, near the coast of Lapland. N. lat. 70° 56'.

INGENDRING. See ENGENDERING.

INGENERATE, in *Natural History*, is a term used to express the kind of petrifications produced by intromission, or the introduction of the mineral particles into the internal texture of the original organized. Martin's "Outlines," p. 67.

INGENHOUS, JOHN, in *Biography*, an eminent physician and chemist, was born at Breda in the year 1730. Little is known of his early life; but in 1767 he came to England with a view of obtaining information on the Suttonian method of inoculation for the small-pox, and in the following year he went, on the recommendation of the late sir John Pringle, to Vienna, to inoculate the archduchess Theresa-Elizabeth, only daughter of Joseph II., and the archdukes Ferdinand and Maximilian, brothers of the emperor. For these services he obtained rewards and honours: he was made body-physician and counsellor of state to their imperial majesties, with a pension of 600*l.* per annum. In the following spring he went to Italy, and inoculated the grand duke of Tuscany: after this he returned to England, to which he was much attached, where he spent his time in scientific pursuits. He published a very valuable work, entitled "Experiments on Vegetables, discovering their great power of purifying the common air in sunshine, but injuring it in the shade and night." This work was first published in 1779, and has been frequently referred to by Dr. Priestley and others, who have carried their observations much farther. It was translated into the French and German languages, and highly esteemed by all the experimental philosophers of that period. He ascertained, that not only from the green matter found on stagnant waters, but likewise from the leaves of vegetables, from the green branches and shoots, even from the entire vegetable, when placed under water and exposed to the solar light, oxygen gas, in a state generally of great purity, is evolved; and as the result of his numerous experiments he adopted the conclusion, that oxygen is elaborated in the leaves and other organs of vegetables, by a vital action excited and sustained by the solar light. The doctor, through the whole of life, was fond of exhibiting among his friends, particularly young persons, experiments of this kind, which required scarcely any apparatus, excepting a bell glass and a phial or two, and with the oxygen gas which he obtained from cabbage leaves or other vegetables, he would exhibit the combustion of iron wire, which is a striking

striking and very brilliant experiment. Dr. Ingenhouz was author of many papers inserted in the Transactions of the Royal Society, of which body he was an active and useful member. Of these papers we may notice the following: Experiments on the torpedo:—Methods of measuring the diminution of bulk taking place on the mixture of nitrous with common air:—Experiments on the electrophorus:—New Methods of suspending magnetic needles:—Considerations on the influence of the vegetable kingdom on the animal creation. He died in the year 1799, highly esteemed for the simplicity of his manners, and for the discoveries which he had made in the several departments of experimental philosophy. Monthly and Gentleman's Magazine. Murray's Chemistry.

INGENITE, INBORN, signifies any disease or habit which comes into the world with a person, nearly the same with hereditary.

INGENUITAS REGNI, anciently signified the freeholders and commonalty of the kingdom: the title was also sometimes given to the barons and lords of the king's council.

INGENUOUS, INGENUUS, among the Romans, a title applicable to a person born free, or of free parents.

Isidore says, they are called *ingenui, qui libertatem habent in genere non in facto*; those who are born free, not those who acquire their freedom.

A person was accounted ingenuous, if only the mother were free, and the father a slave.

These could give their votes, and enjoy offices, from which the *liberti*, or freedmen, &c. were debarred.

INGENUOUS is sometimes also used to signify a native of a country in contradistinction to a foreigner.

INGERAM, in *Geography*, a small island in the straits of Malacca, near the coast of Salengore. N. lat. $3^{\circ} 15'$. E. long. $101^{\circ} 26'$.—Also, a town of Hindoostan, in the circle of Rajamundry; 30 miles S.E. of Rajamundry.

INGETORP, a town of Sweden, in the province of Schonen; 10 miles E. of Ystad.

ENGINEER, or ENGINEER. See ENGINEER.

INGKALU, in *Geography*, a small island in the North sea, near the coast of Lapland. N. lat. $70^{\circ} 50'$.

INGLEBOROUGH, a mountain of England, in the N.W. part of the county of York, said to be 20 miles in circumference. The height is stated by Housman to be 3987 feet; but by the barometrical measurement of Mr. Ewart 2377.12, and by trigonometrical measurement 2380.7 feet above the level of the sea.

INGLOTT, WILLIAM, in *Biography*, an organist of the cathedral church of Norwich, who seems, by an inscription on his monument in that church honourable to his memory, to have been a man of no common abilities. We have never heard or seen any of his productions; but in all probability, Dr. Croft had; who, a hundred years after his decease, had his monument repaired. Ingloft died in 1621.

INGLUVIES. See CRAW.

INGOLSTADT, in *Geography*, a town of Bavaria, situated on the Danube, and surrounded with a morass. It has an university, founded in the year 1472, which embraced the Reformation in 1743; 37 miles N. of Munich. N. lat. $48^{\circ} 43'$. E. long. $11^{\circ} 22'$.

INGOT, a mass or lump of gold or silver, from the mines, melted down, and cast in a sort of mould, but not coined or wrought.

The word seems formed from the French *lingot*, which signifies the same.

INCOT is also a name given to the moulds or cavities, wherein they cast melted metals, or regulus of semimetals.

INGOULT, NICHOLAS LOUIS, in *Biography*, a French Jesuit, was born at Cisors, devoted himself to an ecclesiastical life, and became a very eloquent preacher. He published the eighth volume of the Memoirs of the Missions of the Society of Jesus in the Levant. He was author also of sermons which were highly applauded. He died in 1753.

INGOUELLE, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton, in the district of Le Havre. The place contains 5500, and the canton 10,347 inhabitants, on a territory of 40 kilometres, in six communes.

INGRAFTING, or ENGRAFTING. See ENGRAFTING.

INGRAILED. See ENGRAILED.

INGRAM, ROBERT, in *Biography*, was born in Yorkshire, and educated at Beverley school, from whence he was sent to Corpus Christi college, Cambridge, of which he became fellow, and took there his degrees in arts. His first preferment was the perpetual curacy of Bridhurst, in Kent, after which he obtained successively the small vicarage of Orston, in Nottinghamshire, and the vicarages of Wormington and Boxted, in Essex. He died in 1804, leaving behind him a high character for simplicity of manners, great integrity, and genuine benevolence. He had a high sense of the dignity and importance of the clerical functions, and for 50 years of his life was indefatigable in his attention to professional duties. He was author of "A view of the great events of the seventh plague, or period, when the mystery of God shall be finished." "Accounts of the ten tribes of Israel being in America, originally published by Manasseh Ben Israel, &c." "A complete and uniform explanation of the prophecy of the seven vials of wrath, or seven last plagues contained in the Revelations of St. John, &c."

INGRASSIAS, JOHN PHILIP, was a native of Sicily. He studied medicine at Padua, where he took the degree of doctor in medicine in the year 1537, with singular reputation; inasmuch that he soon received several invitations to professorships from different schools in Italy. He accepted the chair of medicine and anatomy at Naples, which he occupied for a number of years, lecturing to the most crowded audiences drawn by his fame from all parts of the country. He possessed peculiar qualifications for the office, having united a consummate knowledge of the writings of the ancient physicians with great practical skill and a sound judgment, which led him to estimate justly the merits and defects of those fathers of the art. A singular testimony of his talents and unremitting attention to the improvement of his pupils was given by the latter, who caused his portrait to be placed in the schools of Naples with the following inscription: "Philippo Ingrassiae Siculo, qui veram medicinæ artem et anatomen, publicè enarrando, Neapoli restituit, Discipuli memorie causa, P. P." At length he quitted his situation at Naples in order to return to his native island, where he settled at Palermo. Here also he received many marks of public distinction. The rights of citizenship were conferred upon him; and in 1563, Philip II. king of Spain, appointed him first physician for Sicily and the adjacent isles. By virtue of the powers attached to this office he restored order in the medical constitution of the country, by preventing all persons, unqualified by their education and abilities, from practising there. His zeal for the credit of his profession rendered him rigid and severe in his examination of candidates: and he exercised his art himself in the most honourable manner. When the plague raged at Palermo in 1575, he adopted such excellent regulations, in quality

quality of deputy of health and first consultant, that he put a stop to the calamity, and restored the city to health, and was hailed by all the citizens, the Sicilian Hippocrates. The magistrates were so grateful for his services, that they voted him a reward of two hundred and fifty gold crowns a month: but he disinterestedly declined to accept any more than what served for the maintenance and decoration of the chapel of St. Barbe, which he had built in the cloister of the Dominican convent of Palermo. He died greatly regretted in 1580, at the age of 70 years.

Ingraffias cultivated anatomy with great assiduity, and is esteemed one of the improvers of that art, especially in regard to the structure of the cranium, and the organ of hearing. He discovered the small bone of the ear, called the *spates*, which has been claimed as the discovery of others, but is admitted even by Fallopius to have been his. He described minutely the cavity of the *tympanum*, the *fenestra rotunda* and *ovalis*, the *cochlea*, semicircular canals, mastoid cells, &c.; and Eloy thinks, from a view of his plates, that he was acquainted with the muscle of the *malleus*, the discovery of which is ascribed to Eustachius. He is said also to have discovered the femoral vesicles. He was author of the following works: 1. "Jatropologia; Liber quo multa adversus Barbaros Medicos disputantur," Venice, 1544, 1558, 8vo. 2. "Scholia in Jatropologiam," Naples, 1549, 8vo.—3. "De Tumoribus præter naturam," *ibid.* 1553, folio, vol. i. This is properly a commentary on some of the books of Avicenna.—4. "Ragionamento fatto sopra l'infermità epidemica dell' anno 1558," Palermo, 1560, 4to., together with "Trattato di due mostri nati in Palermo in diversi tempi."—5. "Constitutiones et Capitula, necnon Jurisdictiones Regii Proto-Medicatus officii, cum Pandectis ejusdem reformatis," Palermo, 1564, 1657, 4to.—6. "Quæstio de purgatione per medicamentum, atque obiter etiam de sanguinis missione, an sexta die possit fieri," Venice, 1568, 4to.—7. "Galenî Ars Medica," *ibid.* 1573, folio.—8. "De frigida potu post medicamentum purgans Epistola," *ibid.* 1575, 4to., reprinted at Milan, 1586.—9. "Informatione del pestifero e contagioso morbo, il quale affligge e habbe afflito la città di Palermo, e molte altre città e terre del regno di Sicilia, nell' anno 1575 e 1576," Palermo, 1576, 4to. This work was translated into Latin by Joachim Camerarius, and published under the title of "Methodus curandi pestiferum contagium," at Nuremberg, 1583.—10. "In Galeni Librum de ossibus doctissima et expertissima Commentaria," apothumous publication, printed at Messina, in 1603, under the inspection of his nephew, Nicholas Ingraffias. This, which may be deemed the principal work of Ingraffias, contains the text of Galen, in Greek and Latin, with a very diffuse and learned commentary, in which there is much minute and accurate description, particularly of the parts belonging to the organ of hearing. The figures are those of Vesalius. The author defends Galen as far as he is able, but not against the truth of modern discovery. See Eloy. Dict. Hist. Gen. Biog. Haller Bibl. Anatom.

INGRAVING, or ENGRAVING. See ENGRAVING.

INGRE, in *Geography*, a town of France, in the department of the Loiret, and chief place of a canton, in the district of Orleans; four miles N. W. of Orleans. The place contains 2995, and the canton 10,810 inhabitants, in a territory of 16 kilometres, in 10 communes.

INGREDIENTS, all the simples which go into the composition of any medicine, ointment, fauce, or the like.

INGRESS, in *Astronomy*, the sun's entering the first scruple of one of the four cardinal signs, especially Aries.

INGRESS, *Egress*, and *Regress*, in *Law*, are words in

leases of land, signifying a free entry into, a going out of and returning from some part of the premises leased to another; as to get in a crop of corn, &c. after the term expired.

INGRESSU, a writ of entry, whereby a person seeks entry into lands or tenements. It lies in various cases, and has various forms. It is also called *precipe quod reddat*.

INGRIA, or INGERMANLAND, in *Geography*, that part of Russia, which was wrested by Peter the Great from the Swedes, and confirmed to Russia at the peace of Nyfstadt in 1721. It is now called the "Government of St. Petersburg;" which see.

INGRIN, or GRAIN, a town of Africa, in the country of the Foulahs; 30 miles S.W. of Cayer.

INGROSSATOR *Magni Rotuli*, is the same as clerk of the pipe.

INGROSSER, or ENGROSSER, in *Common Law*, is one who buys up corn growing, or any provisions by wholesale, before the market, to sell again. See FORESTALLING.

It also signifies a clerk, who writes records, or instruments of law, on skins of parchment. See ENGROSSING.

INGROSSING of a *Fine*, is the making the indentures by the chirographer, for delivery of them to the party to whom the fine is levied.

INGROWITZ, in *Geography*, a town of Moravia, in the circle of Brunn; 30 miles N.N.W. of Brunn. N. lat. 49° 36'. E. long. 16° 2'.

INGSKAR, a small island in the gulf of Bothnia. N. lat. 61° 15'. E. long. 17° 24'.

INGUE-LOUKA, a town of Chinese Tartary. N. lat. 42° 16'. E. long. 124° 44'.

INGUEN, in *Anatomy*, the technical term for the groin.

INGUIMBERTI, DOMINIC-JOSEPH-MARY D', in *Bio-graphy*, a learned French prelate, was born at Charpentras in 1683. He devoted himself from a very early age to the ecclesiastical profession, became a member of the Dominicans, and afterwards joined the Cistercians, in order that he might submit to what he conceived the more perfect rules of monastic discipline. In this last order his merits raised him to the highest offices of honour and confidence. Being deputed to Rome on the business of his monastery, he so highly recommended himself to the esteem of pope Clement XII. that in the year 1733, he was raised to the rank of bishop of Charpentras, and other ecclesiastical preferment. He died in the year 1757, and is known in the republic of letters by several original works, and translations of others. As a bishop he obtained universal respect, and employed his wealth in serving the public and in relieving the poor. He built a large and noble hospital, and he collected the most extensive and valuable library in Provence, which he gave for the use of the public.

INGUINAL GLANDS, in *Surgery*. See GLANDS.

INGUINAL *Hernia*, a rupture, or protrusion of the bowels at the abdominal ring; a bubonocoele. See HERNIA.

INGUINAL *Ligament*. This, which has been also called from its discoverer ligamentum Fallopii, is an aponeurotic, or ligamentary band, fastened by one end to the anterior and superior part of the os ilium, and by the other to the spine of the os pubis. The middle portion of it is very narrow, but it expands considerably towards both its extremities. It is closely joined to the muscles of the abdomen, and to the aponeurotic fascia of the thigh, but seems to be often wanting.

INGUINALIS, in *Anatomy*, an epithet sometimes applied to the external iliac artery and vein.

INGUL,

INGUL, in *Geography*, a river of Russia, which runs into the Bug, near Matvievka.

INGULETZ, a river of Russia, which runs into the Dnieper; 12 miles N.E. of Cherson.

INGULPHUS, in *Biography*, a monastic historian, was the son of a courtier of Edward the Confessor, and was born at London about 1030. He pursued his maturer studies at Westminster and Oxford, and distinguished himself as a great adept in the Peripatetic philosophy. Scarcely had he attained the age of manhood when he was appointed secretary to duke William, by whose permission he visited the Holy Land and Constantinople in 1064, and upon his return, he entered into the order of the Benedictines at the abbey of Fontenelle, in Normandy, of which he became prior. When his patron, William, obtained the crown of England, Ingulphus was created abbot of the rich monastery of Croyland, which being in a dilapidated state, he rebuilt, and for which he obtained many privileges. He died in 1109, leaving behind him as evidences of his great learning, a work on the life and miracles of St. Guthlac, and a history of the monastery of Croyland. The last gives the author rank with the English historians. It was published at London, by Sir Henry Saville, among the *quinque scriptores*, in 1596, being almost five hundred years after the death of the author. It has been several times reprinted: the best edition is that of Oxford, in 1684.

INGULSK, in *Geography*, a town of Russia, in the government of Ekaterinossav, on the Ingul; 28 miles S. of Elizavet.

INGURTY, a town of Hindoostan, in the province of Golconda; 22 miles S.E. of Warangole.

INGWEILER, a town of France, in the department of the Lower Rhine, on the Moselle; 21 miles N.N.W. of Strasbourg.

INHALER, in *Surgery*, a machine lately invented by Mr. Mudge, and so contrived, that the air drawn through a tube in respiration, passes first through hot water, and thus comes to the lungs loaded with warm vapour. The same air, when expelled in expiration, passes back through the tube, and thence through a valve, when by proper management it may be distributed over the surface of the body and thus act as a vapour-bath. The author's directions for the process are as follow.

In the evening, a little before bed-time, the patient, if of adult age, is to take three drams, or as many tea-spoonfuls of elixir paregoricum in a glass of water: if the subject is younger, *e.g.* under five years old, one tea-spoonful; or within that and ten years, two. About three quarters of an hour after he should go to bed, and being covered warm, the inhaler, filled three parts with water nearly boiling, and wrapped up in a napkin, but so that the valve in the cover is not obstructed by it, is to be placed at the arm-pit, and the bed-cloaths being drawn up, and over it close to the throat, the tube is to be applied to the mouth, and the patient should inspire and expire through it about twenty minutes or half an hour. This, he assures us, is an infallible and immediate cure for the cough consequent on catching cold. Mudge's radical and expeditious Cure for a recent Catarrhus Cough, 1778.

INHALLOW, in *Geography*, one of the smaller Orkney islands, between Pomona and Rousa.

INHAMBANE, or INNANBAM, a kingdom of Africa, in the country of Mocaranga, bounded N. by Sabia, E. and S.E. by the Indian sea, S.W. by the river Manica, and N.W. by an unknown country.

INHAME, in *Botany*. See DIOSCOREA.

INHAMOIT, in *Geography*, a town and district of

Africa, in the country of Mocaranga, situated about S. lat. $17^{\circ} 30'$. E. long. $31^{\circ} 20'$.

INHAMPURA, a river of Africa, in the kingdom of Inhambane, which runs into the Indian sea, S. lat. $24^{\circ} 30'$.

INHANBANO, a river of Africa, which runs into the Indian sea, S. lat. $23^{\circ} 15'$.

INHANGOMA, an island of Africa, in the river Zambeze. S. lat. $17^{\circ} 45'$. E. long. $32^{\circ} 20'$.

INHANZARA, a town of Nubia, in Sennaar; 30 miles from Gießen.

INHAQUEA, a town of Africa, in the kingdom of Sofala, possessed by the Portuguese, near the sea-coast; 20 miles S.W. of Sofala.

INHARMONICAL RELATION, in *Musical*. See RELATION, *inharmonical*.

INHARMONICAL, is said of an interval or chord that is impracticable in harmony, and, consequently, in melody. Notes out of tune are inharmonical.

INHARMONIOUS, or unnatural relations, according to Mr. John Holden (*Essay*, p. 331.) are such intervals as result from the sums of notes or intervals not contiguous in the scale, as a minor third to a major seventh, &c.

INHASATO, in *Geography*, a small island in the Indian sea, near the coast of Africa. S. lat. $20^{\circ} 35'$.

INHERENCE, in *Philosophy*, is applied to the juncture or connection of an accident with its substance.

Thus quantity has a necessary inherence in a natural body.

INHERENT, in *Natural History*, is a term used by Mr. William Martin (*Outlines*, p. 180.) to express that class of organic remains or reliquia, which stick in the surface of the matrix or seat. The extraneous fossils of veins are frequently found in this state.

INHERITABLE BLOOD, in *Law*. See BLOOD.

INHERITANCE, HEREDITAS, a property in lands and tenements to a man and his heirs. See ESTATE, in *Law*.

Inheritance is not only understood where a man hath inheritance of lands and tenements by descent or heritage; but every fee-simple or fee-tail, that a man hath by his purchase, may be said to be an inheritance, because his heirs may inherit it after him. (See *Fee-simple* and *Fee-tail*.) The inheritances mentioned in our law are either corporeal or incorporeal; the corporeal relate to houses, lands, &c. that may be touched or handled; and the incorporeal are rights issuing out of, annexed to, or exercised with corporeal inheritances; as advowsons, tithes, annuities, offices, commons, franchises, &c. (See HEREDITAMENTS.) There is likewise another inheritance denominated several, that is, where two or more hold lands severally; as when two persons hold to them and the heirs of their two bodies, in which case these two have joint-estate during their lives, but their heirs have several inheritances. Goods and chattels cannot be turned into an inheritance. For the rules of inheritance, see DESCENT, *collateral*.

INHIBITION, a writ to inhibit or forbid a judge from farther proceeding in a cause depending before him.

Sometimes prohibition and inhibition are put together, as of the same import; but inhibition is most commonly a writ issuing out of a higher court-christian to a lower; and prohibition out of the king's court to an inferior court.

INHIBITION, in *Scots Law*, is a personal prohibition, which passes by letters under the signet, prohibiting the party inhibited to contract any debt, or do any deed, by which any part of his lands may be aliened or carried off in prejudice of the creditor inhibiting. It must be executed against the debtor, personally, or at his dwelling-house, as summonses, and afterwards published and registered in the same manner with interdictions. Inhibition may proceed either upon

upon a liquid obligation, or even as an action commenced by a creditor for making good a claim not yet sustained by the judge; which last is called "inhibition upon a depending action." Although inhibitions, by their uniform style, disable the debtor from selling his moveable as well as his heritable estate, their effect has been long limited to heritage, from the interruption that such an embargo upon moveables must have given to commerce; so that debts, contracted after inhibition, may be the foundation of diligence against the debtor's person and moveable estate. An inhibition secures the inhibitor against the alienation, not only of lands that belonged to his debtor, when he was inhibited, but of those which he shall afterwards acquire; but no inhibition can extend to such after-purchases as lie in a jurisdiction where the inhibition was not registered; for it could not have extended to those though they had been made prior to the inhibition. An inhibition is simply prohibitory; so that the debt on which it proceeds, continues personal after the diligence. The heir of the person inhibited is not restrained from alienation by the diligence used against his ancestor, for the prohibition is personal, affecting only the debtor against whom the diligence is used. Inhibitions do not of themselves make void the posterior debts or deeds of the person prohibited. When payment is made by the debtor to the inhibitor, the inhibition is said to be "purged."

INHOC, or INHOKE, in our *Old Writers*, is used for any corner or part of a common field ploughed up and sowed with oats, &c. and sometimes fenced in with a dry hedge in that year wherein the rest of the same field lies fallow and common. It is called in the North of England an *intock*, and in Oxfordshire a *bitchin*. And no such *inboke* is now made without the joint consent of all the commoners, who in most places have their share by lot in the benefit of it, except in some manors where the lord has a special privilege in so doing. Kennet's Paroch. Antiq. 297, &c. and his Glossary.

The word is Saxon, compounded of *in*, *within*, and *boke*, *a corner*.

INHUMATION. See BURIAL and INTERMENT.

INHUMATION, in *Chemistry*, a method of digelling substances together, by burying the vessel in which they are put in horse-dung, or in dry sandy earth exposed to the sun. See DIGESTION.

INIA, in *Geography*, a river of Russia, which runs into the Oby, 50 miles N.E. of Kolivan.—Also, a river of Russia, which runs into the Lena, N. lat. 55° 20'. E. long. 116° 14'.

INJAMBI, or TIETE, a river of Brazil, which runs into the Parana, 180 miles N.W. of St. Paul, on the borders of Paraguay.

INIARA, a town of Russia, in the government of Penza; 48 miles W. of Penza.

INJECTION, in *Anatomy*, is the art of filling the blood-vessels or other hollow organs of the dead body with various substances, for the purpose of investigating their structure, situation, &c. or for displaying any facts connected with these subjects by subsequent artificial preparation. See PREPARATIONS, *Anatomical*.

INJECTION, in *Pharmacy*, any liquid medicine made to be injected or thrown into the body, or any of its parts, by a syringe, clyster-pipe, or other instrument.

INJECTION, or *Injecting*, in *Surgery*, the throwing in some liquor or medicine into a vein opened by incision. This practice, and that of transfusion, or the conveying the arterial blood of one man, or other animal, into another, were once greatly practised, but are now laid aside.

The method of injecting is this? a vein is to be opened in

the arm with a lancet as in bleeding, and a small pipe of a syringe being introduced at the orifice, the liquor intended to be mixed with the blood, and contained for that purpose in the body of the syringe is to be forcibly injected, or thrown into the vein upwards, or toward the heart; which done, the orifice is to be secured with compresses and bandages as in bleeding.

Whether this practice of injecting proper medicines into the blood may not be found of use in apoplexies, quinies, hydrophobia, &c. is worthy to be tried by repeated experiments. The method of injecting liquors into the blood of living animals, is said to be the invention of sir Christopher Wren. His method was by making ligatures on the veins, and opening them on the side of the ligature towards the heart: then putting into them small syringes or quills fastened to bladders in the manner of clyster-pipes, containing the matter to be injected. Mr. Boyle soon made the experiment upon dogs, with infusions of opium and crocus metallorum; all which he circumstantially described, in his *Usefulness of Experimental Philosophy*, part ii. eff. 2. Phil. Trans. N° 7. p. 128.

The ingenious Dr. Hales made a variety of experiments of this kind on different animals. See his *Statistical Essays*, vol. ii. passim.

Many disorders of particular parts are no way curable, unless the parts affected are injected with a proper liquor by means of a syringe and proper tube. The method of performing this is too obvious to need any directions; but these general cautions are necessary in regard to it, that the syringe or tube be applied tenderly and carefully to the parts, especially in very sensible or nervous parts, to avoid giving the patient any pain; and that the liquor to be injected be neither too hot nor too cold.

In ulcerations and inflammations of the uvula, tonsils, and fauces, injections are generally useful: but care must be taken to press down the tongue with a spatula, or with the flat end of a spoon, and having introduced the syringe two or three fingers breadth into the mouth, the injection is to be carefully and gently thrown in at several times. In gonorrhœas, injections are often necessary to allay the heat and soreness of the urethra, and to wash out the matter. The safest and best injections on this occasion are warm milk and barley-water, sweetened with sugar, honey, or syrup of marshmallows; and towards the end a little saccharum saturni, dissolved in plantane water.

INJELLEE, in *Geography*, a province of Bengal, on the right side of the Hoogly, near its mouth.

INIO, a small island in the Baltic, near the coast of Finland, with a town. N. lat. 60° 26'. E. long. 21° 14'.

INIS, a word in the Irish language signifying *island*; and therefore used as a prefix to the names of many islands on the coast of Ireland, some of which are noticed in succeeding articles, but a much greater number passed by as too insignificant.

INISBEG, in *Geography*, the name of several small islands on the coast of Ireland, the name signifying *Little Island*. One of these is in a small bay of the county of Cork, near the town of Skibbereen; another is on the west coast of Kerry, near the Great Blasket island; and a third is on the north coast of the county of Donegal, about 6 miles N.E. of Bloody Farland Point.

INIS-BOFFIN, or ENNISBOFFIN *i. e.* the island of the *White Cow*, an island near the west coast of Ireland, containing 1200 acres. It is about a mile and a half from the main land of the county of Galway, and is a parish in the diocese of Tuam. There was formerly an abbey here. There is an island of the same name on the coast of Donegal,

gal, about four or five miles E. by N. of Bloody Farland Point; and a third in Lough Ree, an expansion of the river Shannon, in which was an abbey that the Danes plundered and destroyed in 1089. Beaufort, Carlisle.

INISCALTRA, or INISCALTHRA, an island situated in the river Shannon, belonging to the county of Galway, about two miles S. from mount Shannon, and eight N. by W. from Killaloe. In this beautiful island are a fine anchor-tower, above seventy feet high, and the remains of seven small churches.

INISCATTERY, or INISCATHRIE, an island belonging to the county of Clare, province of Munster, Ireland. This rich and beautiful little island is situated at the entrance of the river Shannon, between the counties of Kerry and Clare, two miles S. by W. from Kilrush, and nearly opposite to the castle of Canrigfoile, which was besieged and taken by sir W. St. Leger in 1580. According to Mr. Archdall, a monastery was founded in Iniscattery, of which St. Senan was the first abbot. There were eleven churches for the monks, and no women were permitted to land on the island before the coming of the Danes into Ireland. In process of time it became a priory of regular canons. The monument of St. Senan is still to be seen here, with the remains of eleven small churches and several cells: in the stone that encloses the top of the altar window of the great church is the head of the saint with his mitre, boldly executed, and but little defaced. An ancient round tower of 120 feet in height, and in complete repair, graces the scene. This island is remarkable for the resort of pilgrims on certain festivals. Archdall, Carlisle.

INISDRISUL, or INISDRISCOL, an island belonging to the county of Cork, province of Munster, Ireland, situated in *Roaring Water Bay*, a little north of Cape Clear island.

INISDUFF, or INNISDUIH, a small island off the coast of Donegal, in the province of Ulster, Ireland, about six miles N.E. from Bloody Farland Point. Carlisle.

INISFREE, the name of two islands off the west coast of the county of Donegal, province of Ulster, Ireland; one of which is in the cluster of the North Arran isles, a little south of Rutland; the other, which gives name to a small harbour, lies between Rutland and Bloody Farland Point. MacKenzie, Beaufort.

INISGLORA, a small uninhabited island off the west coast of Mayo, in the province of Connaught, Ireland.

INISGOULA, an island in Clew bay, county of Mayo, province of Connaught, Ireland, on the east side of which is good anchorage for large vessels. Mackenzie.

INISHARK ISLAND, an island near the west coast of Ireland and county of Galway. N. lat. $53^{\circ} 34'$. W. long. $10^{\circ} 14'$.

INISHEGIL, or, according to Mackenzie, *Inisbegil*, an island off the coast of Mayo, Ireland, between Achill island and the main land.

INISHERKAN, an island near the south coast of Ireland, belonging to the county of Cork, on the west side of Baltimore harbour. N. lat. $51^{\circ} 24'$. W. long. $9^{\circ} 19'$.

INISHONAN, or INISHANNON, a post-town of Ireland, in the county of Cork, and province of Munster. It is on the Bandon river, ten miles from Cork, three from Bandon, and 133 S.W. from Dublin.

INISHOWEN, a large peninsula and barony of the county of Donegal, Ireland, which stretches N.E. from Londonderry, bounding Lough Foyle. It is a dreary mountainous region, but great exertions have been made to meliorate its natural rudeness. It indeed returns a greater

rent than any other part of the county. The mountains feed a number of cattle, and the flats produce tolerable crops. They have manure of the best quality in abundance, such as limestone, shells, and sea-ware, which act powerfully upon the barrenness of the soil. Robertson.

INISHOWEN Head, a cape in Ireland, forming the eastern extremity of the peninsula, a little north of the entrance into Lough Foyle. N. lat. $55^{\circ} 15'$. E. long. $6^{\circ} 48'$.

INISKEA, the name of two small islands off the west coast of Ireland, between which there is good anchorage. They are about two miles from the peninsula of the Mullet, in the county of Mayo; between $54^{\circ} 7'$ and $54^{\circ} 10'$ N. lat. and 10° W. long.

INISLIRE, an island in Newport or Clew bay, county of Mayo, Ireland, which gives name to one of the best stations for vessels in that extensive bay. Mackenzie.

INISMURRY, INISMURRA, or *Innis-mudhr*, an island which lies off the coast of Sligo, Ireland, about three miles distant from the main land. It contains 130 acres, two wells of excellent water, and some bog of remarkably good turf. The inhabitants are few, and live by fishing. There are the remains of some chapels within a stone wall ten feet high, and from five to seven and eight feet thick, without cement. Mr. Archdall says it is impossible to determine whether it is round or oval; and that more rude, inelegant workmanship was never seen. There are a few cells underground, which receive their light, some through a hole at the top, others through a loop-hole in the side; they are dark and horrible dungeons. Gen. Vallancey infers from part of these ruins, that in Pagan times, the island was dedicated to the worship of Boötha, and says that a monument in this island is an exact representation of the Mahoody of the Gentoos found in the island of Elephanta, near Bombay, by captain Pyke. Many devotees still flock to this island to do penance in the cells, and many are brought from great distances to be buried in the churches. There is a ledge of rocks running from this island, which require the attention of all who enter the bay of Sligo. Vallancey's Prospectus of a Dictionary; Carlisle.

INISTIOGE, a small post-town of Ireland; in the county of Kilkenny, and province of Leinster. It is situated on the river Nore, which is navigable to it, and over which it has a bridge with ten arches. Inistioge is one of those places which before the Union sent two members to the house of commons of Ireland. It is 63 miles S.W. from Dublin.

INISTUISKAR, an island off the west coast of the county of Kerry, Ireland, about four miles from Caunfza head, and north of the Blasquets. N. lat. $52^{\circ} 8'$. W. long. $10^{\circ} 25'$.

INISTURC, an island situated about seven miles from the west coast of Mayo, Ireland, not far from the Killeries. N. lat. $53^{\circ} 42'$. W. long. 10° .

INITIALIA, a name anciently given to the mysteries of Ceres. See CEREALIA.

INITIALIS *et pausa generalis*, the beginning of a musical composition, and the end. See TEMPO, PROLATION, and PAUSE.

INITIANS PUNCTUM. See PUNCTUM.

INITIATE, *Tenant by Curtesy*, in Law. See TENANT. INITIATED, a term properly used in speaking of the religion of the ancient heathens; where it signifies being admitted to the participation of the sacred mysteries.

The word comes from the Latin *initatus*, of *initiare*, *initiare*; which properly signifies to begin sacrificing, or to receive or admit a person to the beginning of the mysteries, or of ceremonies of less importance.

The ancients never discovered the deeper mysteries of their religion, nor even permitted some of their temples to be opened to any but those who had been initiated. See MYSTERY.

INJUNCTION, in *Law*, a writ generally grounded upon an interlocutory order or decree out of the court of chancery or exchequer, sometimes to give possession to the plaintiff, for want of the defendant's appearance; sometimes to the king's ordinary court, and sometimes to the court-christian, to stop proceedings in a cause, upon suggestion made, that the rigour of the law, if it take place, is against equity and conscience in that case, that the complainant is not able to make his defence in these courts for want of witnesses, &c. or that they act erroneously denying him some just advantage. The writ of injunction is directed not only to the party himself, but to all and singular his counsellors, attorneys, and solicitors; and if any attorney, after having been served with an injunction, proceeds afterward contrary to it, the court of chancery will commit the attorney to the fleet for contempt. But if an injunction be granted by the court of chancery in a criminal matter, the court of king's bench may break it, and protect any that proceed in contempt of it.

INJURY, **INJURIA**, in a general sense, signifies any thing contrary to justice and equity; that is, any wrong or damage done to a man's person, reputation, or goods.

The word is derived from the Latin preposition *in*, which here has a negative power; and *jus, law, right*: *injuria, dicitur omne quod non jure fit*. The ancients made a goddess of injury, and called her Ate. Homer makes her the daughter of Jupiter, and says she did mischief to every body, even to her father; that she was very nimble and tender-footed, and walked altogether on men's heads without ever touching the ground.

Civilians define injury a private offence, committed designedly, and with an evil intention to any man's prejudice, with regard to his person or his property. All civil injuries are of two kinds; the one without force or violence, as slander or breach of contract; the other joined with force and violence, as batteries and false imprisonment. The author of the Rhetorics to Herennius says, "Injuria est quæ aut pulsatione, aut convitio, aut turpitudine, corpus, aurès, aut vitam alicujus violavit."

By the Roman law, the action for an injury was annual: that is, no reparation could be required after the expiration of a year. By the law of the twelve tables, where the injury was the breaking of a limb, the injured person might demand talionem, that is, that he might break the same limb of the criminal.

For the breaking of a bone there were also considerable pecuniary punishments assigned: for other injuries only twenty asses were decreed, which the poverty of those times thought a sufficient penalty; but the prætors afterwards finding this too slender a satisfaction, in lieu thereof, appointed the injured person to set a rate on the injury, which they afterwards increased or lessened as they thought good.

Some of our lawyers make a distinction between a *damage* and an injury; and indeed there are many acts which may be done to the prejudice of a third person, which may be properly said to be *damnum sine injuria*.

As the absolute rights of individuals are those of personal security, personal liberty, and private property, the wrongs or injuries affecting them must consequently be of a corresponding nature. Injuries that affect the personal security of individuals are injuries against their lives, their limbs, their bodies, their health, or their reputation. For the first class of injuries, see **HOMICIDE**, **MANSLAUGHTER**,

and **MURDER**. The two next species of injuries, affecting the limbs or bodies of individuals, may be committed by *threats, assault, battery, wounding, mayhem*, which see respectively. For the four last injuries now enumerated, an indictment may be brought as well as an action; and frequently both are accordingly prosecuted, the one at the suit of the crown for the crime against the public; the other at the suit of the party injured, to make him a reparation in damages. Injuries affecting a man's health are those by which any unwholesome practices of another cause a man to sustain any apparent danger in his vigour or constitution: as by selling him bad provisions, as wine (1 Roll. Abr. 90.); by the exercise of a noisome trade, which affects the air in the neighbourhood (9 Rep. 52. Hutt. 135.); or by the neglect or unskilful management of his physician, surgeon, or apothecary. (Lord Raym. 214.) For these injuries, unaccompanied by force, there is a remedy in damages, by a special action of *trespass upon the case*. Injuries affecting a man's reputation, or good name, are, first, by malicious, scandalous, and slanderous words, tending to his damage and derogation. (See **WORDS** and **SCANDALUM MAGNATUM**; and **ACTION upon the case**.) A second way of affecting a man's reputation is by printed or written libels, pictures, signs, and the like; which set him in an odious or ridiculous light, and thereby diminish his reputation. (2 Shaw. 314. 11 Mod. 99.) See **LIBEL**. A third way of destroying or injuring a man's reputation is by preferring malicious indictments or prosecutions against him; which, under the mask of justice and public spirit, are sometimes made the engines of private spite or enmity. For this, however, the law has given a very adequate remedy in damages, either by an action of conspiracy (Finch. L. 305.), which cannot be brought but against two at the least; or, which is the more usual way, by a special action on the case for a false and malicious prosecution. (F. N. B. 116.) The violation of the right of personal liberty is effected by the injury of false imprisonment, for which the law has not only decreed a punishment, as a heinous public crime, but has also given a private reparation to the party; as well by removing the actual confinement for the present, as, after it is over, by subjecting the wrong doer to a civil action, on account of the damage sustained by the loss of time and liberty. (See **IMPRISONMENT**, and **FALSE Imprisonment**.) The injuries that affect the rights of personal property, affect it either as it is in possession or in action. (See **PROPERTY**.) The former kind of property is liable to two species of injuries, *viz.* the amotion or deprivation of that possession, and the abuse or damage of the chattels, while the possession continues in the legal owner. The deprivation of possession comprehends the unjust and unlawful taking away, and the unjust detention, though the original taking might be lawful. The remedy which the law has provided for the wrongful taking of goods, is the restitution of them, with damages for the loss sustained by such unjust invasion, which is effected by action of "replevin," which see. Other remedies for other unlawful taking of a man's goods consist only in recovering a satisfaction in damages, by an action of *trespass vi et armis*, or action of *trover* and *conversion*, which see respectively. For unjust detention of another's goods, when the original taking was unlawful, the remedy for the recovery of possession is by action of *detinue*; or action of *trover*, which see. The remedies given by the law to redress damages, which the things detained may have suffered, are action of *trespass vi et armis*, where the act is in itself immediately injurious to another's property, and accompanied with some degree of force; and special *action on the case*, where the act itself is indifferent, and the injury only conse-

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quential, and therefore arising without any breach of the peace. As to injuries that regard things in *action* only, they pertain to such rights as are founded on, and arise from contracts, which may be either *express* or *implied*. The former are *debts, covenants, and promises*; see each term: the latter are such as reason and justice dictate, and which the law presumes that every man has contracted to perform. Thus it is that every person is bound, and hath virtually agreed to pay such particular sums of money as are charged upon him by the sentence, or assessed by the interpretation of the law. A debt is thus contracted, and the defendant is bound to pay it. The same reasoning will apply to all penal statutes, that is, such acts of parliament by which a forfeiture is inflicted for transgressing the provisions therein enacted. The party offending must pay the forfeiture incurred to such persons as the law requires. Another class of contracts includes those which arise from natural reason, or the just construction of law. (See *ASSUMPSIT*.) The last class of contracts, implied by reason and construction of law, arises upon this supposition, that every one who undertakes any office or employment, trust or duty, contracts with those who employ or trust him, to perform it with integrity, diligence, and skill; and if for want of these qualities any injury accrues to individuals, they have their remedy in damages by a special action on the case.

Besides the special action on the case, there is also a peculiar remedy, entitled an action of *deceit*, (F. N. B. 95.) to give damages in some particular cases of fraud, and principally where one man does any thing in the name of another, by which he is deceived or injured.

As to those injuries that affect men with regard to their *relative* rights, they may be done to persons under the four following relations: husband and wife, parent and child, guardian and ward, master and servant; and they comprehend in the relation of a husband, *abduction, adultery, and beating* or otherwise abusing the wife. In the relation of a parent, the injury is *abduction*, which is remedied by a writ of *ravishment*, or action of *trespass vi et armis, de filio vel filia, rapto vel abducto*. (F. N. B. 90.) See the other terms above specified.

Having briefly recited the principal injuries that may be offered to *personal* property, with their several remedies by suit or action, we shall next direct our attention to those injuries which affect that species of property which the laws of England have denominated *real*. Real injuries, or injuries affecting real rights, are principally the following six; *ouster, trespass, nuisance, waste, subtraction, and disturbance*; which see respectively. Blackst. Com. b. iii.

INJURIES of the Head. Some subjects, connected with this highly interesting part of *surgery*, have already been treated of in the preceding volumes of this Cyclopædia. See *COMPRESSION*; *CONCUSSION*; and *EXTRAVASATION*. Here it is incumbent upon us to consider certain other cases, which are the consequence of external violence applied to the head, as wounds and contusions of the scalp; inflammation of the dura mater, and suppuration under the cranium; fractures of the skull, &c.

Injuries of the Scalp.—Injuries done to the scalp by external violence are generally of a more serious nature than a similar degree of mischief done to any other part of the common integuments. Surgical authors have endeavoured to account for this fact by adverting to the prodigious quantity of nervous filaments distributed to the scalp, the many different parts which compose it, its structure, connections, &c. We are not, however, to suppose every injury of the external coverings of the head dangerous. A mere cut with a sharp instrument usually heals as favourably in this situation as in any other, and often more so, perhaps, in conse-

quence of the great vascularity of the skin of the head, and the very steady manner in which the edges of the wound admit of being kept in contact, supported as they are upon the fixed surface of the cranium. But punctures, lacerated wounds, and contusions of the scalp, as every experienced surgeon well knows, are cases frequently followed by such symptoms as may terminate fatally.

We shall pass over incised wounds of the scalp, since they are attended with no peculiarity, and only require the same treatment as ordinary cuts upon any part of the surface of the body.

Lacerated wounds of the scalp are divided by Mr. Pott into two kinds; *viz.* those in which the scalp, though torn, or unequally divided, still keeps its natural situation, and is not stripped nor separated from the cranium to any considerable distance beyond the breadth of the wound; and those, in which it is considerably detached from the parts it ought to cover.

The first of these, if simple, and not combined with the symptoms, or appearances of any other mischief, do not require any particular or different treatment from what the same kind of wounds require on all other parts; but the latter, or those in which the scalp is separated and detached from the parts it ought to cover, are not only, by the different methods in which they may be treated, frequently capable of being cured with a considerable deal more or less ease and expedition, but are also sometimes a matter of great consequence to the health and well-being of the patient.

Not many years ago surgeons were accustomed to treat this last sort of case in a most objectionable way. Too hastily convinced of the impossibility of the separated and torn pieces of the scalp ever becoming united again, practitioners used, without hesitation, to cut them away, so as to occasion a large sore, requiring a long time to heal, and leaving considerable deformity. Far different is the practice of the most approved modern surgeons, with whom it is an invariable maxim, that the preservation of the scalp ought always to be attempted. The reasons for this line of conduct are plain and obvious. The detached portions of the scalp were formerly cut off, because it was supposed that they were in such a state as precluded all chance of their union. But the fact is, it can never be foreseen with certainty whether the detached torn edges of a lacerated wound will slough or not. Now, as no harm can arise from trying whether they will live and unite; as considerable benefit will result from the success of such an attempt; and, as the excision of the part is painful, and productive of no solid advantage, even when sloughing is unavoidable, the method is supported neither by reason nor experience. Whatever may be the course of the case, the proceeding is only calculated to cause unnecessary pain, lengthen the time required for the cure, and render deformity, which is uncertain, quite inevitable. The head having been shaven round the wound, the torn piece of the scalp is to be first freed from all dirt and extraneous substances, and then restored as quickly and as perfectly as possible to its natural situation. Strips of adhesive plaster fully suffice for bringing the parts together without the assistance of sutures, which, unless absolutely necessary, ought never to be used. It has always appeared to us a very beneficial plan to maintain the pieces of the scalp closely applied to the cranium by means of small lint-compresses, bound on with adhesive plaster. Thus, no cavity will be left for the lodgment of matter, and the parts will have the fairest opportunity of uniting. Sometimes the loosened scalp will unite with the parts from which it was torn and separated, and there will be no other sore than what

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what arises from the impossibility of bringing the lips of the wound into smooth and immediate contact, the fear of which fore must be small in proportion. Sometimes such perfect re-union is not to be obtained; in which case matter will be formed and collected in those places where the parts do not coalesce; but this will not hinder the preservation of the coverings of the head, the cure being only a little retarded by a few small abscesses, and the matter admitting of being let out by one or two small openings.

Occasionally, the whole separated piece will unite perfectly, especially in young and healthy persons. In certain instances the union will take place in some parts, and not in others; and, consequently, matter will be formed, and require to be discharged, perhaps, at several different points. In other particular cases, circumstances, and habits, there will be no union at all, the torn cellular membrane, or the naked aponeurosis will inflame and become sloughy, a considerable quantity of matter will be collected, and, perhaps, the cranium will be denuded. But even in this case, if the surgeon takes proper measures, and refrains from being too much in a hurry to cut, things will be more prosperous than may be expected. Let him take care to keep the inflammation under by proper means; let him have patience till the matter is fairly and fully formed, and the sloughs perfectly separated; and when this is accomplished, let him make a proper number of dependent openings; and let him, by bandage and other proper management, keep the parts in constant contact with each other, and he will often find, that, although he was foiled in his first intention of procuring immediate union, yet he will frequently succeed in this his second; he will still save the scalp, shorten the cure, and prevent the great deformity arising, particularly to women, not only from the fear, but from the total loss of hair.

Many persons have erroneously thought, that, when the pericranium is stripped off the cranium by external violence, or is afterwards cast off, the scalp cannot unite to the denuded cranium, which must of necessity exfoliate. However, these notions are now well known to be unfounded. The exposed part of the skull, unless much injured by contusion, or improperly irritated by stimulating applications, will generally live, throw out granulations, and become united to the separated scalp, without any exfoliation whatever.

Punctured wounds of the scalp are more apt than cuts to inflame and give trouble, and are indeed frequently the cause of severe and alarming symptoms.

According to Mr. Pott, if the wound affects the cellular membrane only, and has not reached the aponeurosis, or pericranium, the inflammation and tumour affect the whole head and face, the skin of which wears a yellowish cast, and is sometimes thick set with small blisters, containing the same coloured serum; it receives the impression of the fingers, and becomes pale for a moment, but returns immediately to its inflamed colour; it is not very painful to the touch, and the eye-lids and ears are always comprehended in the tumefaction, the former of which are sometimes so distended as to be closed; a feverish heat and thirst generally accompany it; the patient is restless, has a quick pulse, and most commonly a nausea and inclination to vomit.

Cases are most disposed to assume this form in persons of bilious habit, the inflammation being in fact erysipelatos. The disorder is somewhat alarming to look at, but it is not often attended with danger. Mr. Pott remarks, that the wound does, indeed, neither look well, nor yield a kindly discharge, while the fever continues; but still it has none of that look which bespeaks internal mischief; the scalp continues to adhere firmly to the skull; nor does the patient

suffer the tensive pain, and fatiguing restlessness, which generally attend mischief underneath the skull.

Such erysipelatos inflammation commonly soon yields to phlebotomy, lenient purges, and febrifuge medicines, particularly those of the neutral kind. When the inflammation is gone off, it leaves on the skin a yellowish tint, and a dry scurf, which also, in time, disappear. Immediately the disorder subsides, the wound puts on a healthy aspect, and heals without trouble.

Surgeons must carefully distinguish from the foregoing case another kind of erysipelatos swelling and inflammation to which the scalp is liable, as one of the effects of inflammation and suppuration of the dura mater. In this last important disorder the febrile symptoms are much higher, the pulse harder and more frequent, the anxiety and restlessness extremely fatiguing, the pain in the head intense; and as, in these circumstances, the swelling of the scalp is most frequently the immediate precursor of matter forming between the skull and dura mater, it is generally attended with irregular shiverings, which are not followed by a critical sweat, nor afford any relief to the patient. When the inflammation is confined to the parts on the outside of the skull, the erysipelas generally appears within the first three or four days; but when the dura mater is affected, it seldom comes on till several days after the accident, when the symptomatic fever is got to some height. In the simple erysipelas, although the wound be crude and undigested, yet it has no other mark of mischief; the pericranium adheres firmly to the skull, and, upon the cessation of the fever, all appearances become immediately favourable. In that which accompanies injury done to the parts underneath, the wound not only has a spongy, glassy, unhealthy aspect, but the pericranium in its neighbourhood separates spontaneously from the bone, and quits all cohesion with it. In short, says Mr. Pott, one is an accident proceeding from a bilious habit, and not indicating any mischief beyond itself; the other is a symptom, or a part of a disease, which is occasioned by injury done to the membranes of the brain; one portends little or no ill to the patient, and almost always ends well; the other implies great hazard, and most commonly ends fatally.

When the wound is small, and reaches to the aponeurosis and pericranium, disagreeable, and even alarming symptoms sometimes arise. In the case alluded to, the inflamed scalp does not rise into that degree of tumefaction as in the erysipelas; neither does it pit, or retain the impression of the fingers of an examiner. It is of a deep red colour, unmixed with the yellow tint of the erysipelas; it appears tense, and is extremely painful to the touch. The ears and eye-lids are seldom comprehended in the tumour, though they may partake of the general inflammation of the skin. It is generally attended with acute pain in the head, and such a degree of fever as prevents sleep, and sometimes brings on delirium. A patient, thus affected, may be more freely bled than one labouring under an erysipelas. Warm fomentations are proper in both cases; but emollient poultices, which are forbidden in erysipelatos diseases, may be employed in the present instance with much advantage.

In exceedingly urgent cases, Pott recommends making a division of the wounded part down to the bone, to the extent of half an inch, or an inch, as the best means of stopping the fever, and preventing the aponeurosis and pericranium from becoming sloughy.

Mere contusions of the scalp, unattended by fracture, or injury of the parts within the cranium, are not of serious importance, considered abstractedly. It frequently happens, that when a severe bruise has been inflicted on the scalp, a large tumour, containing extravasated blood, quickly rises upon

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upon the head, or blows on this part with stones, sticks, &c. But, notwithstanding the immense disfigurement attending this sort of accident, if the skull and its contents be free from injury, the case is not of a dangerous nature. The effused blood generally admits of being removed by absorption, provided the surgeon is careful to keep the patient's bowels well open with saline purges, and apply to the tumour itself linen wet with the saturnine lotion, or with a lotion composed of spirit of wine, vinegar, and the muriate of ammonia. Many surgical authors countenance the plan of discharging the collection of blood by a small puncture. As far as our observations extend, this practice should be avoided in the generality of instances. When an opening is made, suppuration within the swelling becomes inevitable. On the contrary, abscesses may frequently be prevented altogether, by allowing the absorbents to do the office of taking away the effused blood, assisted by the means already recommended. It is not to be denied, however, that matter will sometimes form, and then the method of making an opening for the discharge of the contents of the swelling is undoubtedly proper.

With regard to those tumours of the scalp, which are the consequence of blows, falls, &c. and which are filled with effused blood, J. L. Petit made a remark, which has been repeated by all subsequent writers, namely, the facility with which the centre of the swelling may be depressed, while the circumference seems hard and prominent, circumstances which may easily impose upon the inexperienced surgeon, and lead him to mistake the case for a fracture of the cranium with depression of the bone. If, upon such a supposition, he immediately makes an incision into the tumid scalp, he may give the patient a great deal of unnecessary pain, and endanger his own reputation.

It is observed by Mr. Pott, that in this case the touch is so liable to deception, that recourse should always be had to other circumstances and symptoms, before an opinion is given. If a person, with such tumour occasioned by a blow, and attended with such appearances and feel, seems to labour under dangerous pressure upon the brain, a division of the scalp, in order to enquire into the state of the skull, is right and necessary; but if the patient is well, or not seriously affected with any symptoms of compression, he merely feel of some thing like a fracture, nay, we may add, even the actual existence of a fracture itself, will not authorize or vindicate cutting the scalp.

For an account of the symptoms of pressure on the brain, see COMPRESSION and EXTRAVASATION.

Inflammation of the Dura Mater, and Suppuration under the Skull.—The symptoms attending an inflamed or sloughy state of the membranes of the brain, in consequence of external violence, are all of the febrile kind, and never at first imply any unnatural pressure upon the brain. When, in these cases, the symptoms of pressure come on, it is not until the latter end of the disease, that is, until a considerable quantity of matter is formed, which matter must press like any other fluid.

The late eminent Mr. Pott has written a most able description of the inflammation and suppuration of the dura mater from external violence. The following observations are chiefly from his pen.

When there is neither fissure nor fracture of the skull, nor extravasation, nor commotion underneath it, and the scalp is neither considerably bruised nor wounded, the mischief is seldom discovered or attended to for some few days. The first attack is generally by pain in the part which received the blow. This pain is soon extended all over the head, and is attended with a languor or dejection of strength and spirits, which are soon followed by a nausea and inclination

to vomit, a vertigo or giddiness, a quick and hard pulse, and an incapacity of sleeping. A day or two after this attack, if no means preventive of inflammation are used, the part stricken generally swells, and becomes puffy and tender, but not painful. Neither does the tumour rise to any considerable height, nor spread to any great extent. If this tumid part of the scalp be now divided, the pericranium will be found of a darkish hue, and either quite detached, or very easily separable from the skull, between which and it will be found a small quantity of a dark-coloured ichor. If the disorder is so advanced, that the pericranium is quite separated from the skull, the latter will be found somewhat altered in colour from a healthy bone.

From this time the symptoms generally advance more hastily and more apparently; the fever increases, the skin becomes hotter, the pulse quicker and harder, the sleep more disturbed, the anxiety and restlessness more fatiguing; and to these, says Mr. Pott, are generally added irregular rigours, which are not followed by any critical sweat, and which, instead of relieving the patient, add considerably to his sufferings. If the scalp has not been divided, until the symptoms are thus far advanced, the alteration of the colour of the bone will be found to be more remarkable; it will be found to be whiter and more dry than a healthy one; or, as Fallopius has observed, it will appear rather like dead bone.

There will be more sanies or fluid under the pericranium, and this membrane will have a more livid aspect.

In this state of matters, if the dura mater be denuded, it will be found to be detached from the inside of the cranium, to have lost its bright silver hue, and to be smeared over with a kind of mucus or pus. Every hour after this period all the symptoms are exasperated; the head-ache and thirst become more intense, the strength decreases, the rigours are more frequent, and, at last, convulsive motions, attended in some with delirium, in others with paralysis, or comatose stupidity, finish the tragedy.

If the scalp is now divided, a very offensive discoloured fluid will be found lying on the bare and altered cranium. If, at this period, a perforation is made in the bone, matter will be found between it and the dura mater, generally in considerable quantity, but different in different cases and circumstances. Sometimes it will be in great abundance, and diffused over a very large part of the membrane; and sometimes the quantity will be less, and consequently the space which it occupies smaller. Sometimes it lies only on the exterior surface of the dura mater; and sometimes it is between it and the pia mater, or also on the surface, or in the substance of the brain.

The foregoing mischief is entirely the consequence of the contusion which the head has suffered. But it deserves attention, that as the inflammation and separation of the dura mater are not immediate consequences of the violence, so neither are the symptoms immediate, seldom coming on until some days have passed.

We have next to consider the case where the scalp has been wounded, either by the accidental violence, or by the surgeon making an incision immediately afterwards for the examination of the bone. Here the wound will, for some little time, have nothing particular about it; but after a few days, any favourable appearances which it may have put on will vanish; the sore will lose its florid complexion and granulated surface; will become pale, glassy, and flabby; instead of good matter, it will discharge only a thin discoloured sanies; the lint with which it is dressed, instead of coming off easily, as in a kindly suppurating sore, will stick to all parts of it; and the pericranium

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cranium, instead of adhering firmly to the bone, will separate from it all round to some distance from the edges.

This alteration in the face and circumstances of the sore is produced merely by the diseased state of the parts underneath the skull, as is demonstrably proved, by observing that the bad aspect of the wound, and the spontaneous separation of the pericranium, are always confined to that part which covers the altered or injured portion of the dura mater, and do not at all affect the rest of the scalp; nay, observes Mr. Pott, if it has by accident been wounded in any other part, or a portion has been removed from any part where no injury has been done to the dura mater, no such separation will happen. The detachment above will always correspond to that below, and be found no where else.

At first the exposed part of the skull appears whiter and more dry than natural, and in proportion as the dura mater suppurates or becomes sloughy, the bone inclines more and more to a kind of purulent hue, or whitish yellow. It deserves notice, likewise, that if the blow has occurred near a suture, and the subject is young, such suture often separates so as to let through it a loose painful fungus. At this period also the head and face are frequently attacked with erysipelas.

The above described effects of certain contusions of the head are frequently found to accompany fissures and undepressed fractures of the cranium, as well as extravasations of fluid, where the bone is entire; and on the other hand, says Mr. Pott, all these do often happen without the concurrence of this individual mischief. All this is matter of accident; but let the other circumstances be what they may, the spontaneous separation of the altered pericranium, in consequence of a severe blow, is almost always followed by a suppuration between the cranium and dura mater; a circumstance, which Mr. Pott points out as highly worthy of attention in fissures and undepressed fractures of the skull, because it is from this cause principally that the bad symptoms, and the hazard in such cases, arise.

The situation of extravasated blood within the cranium is often uncertain; but that of inflammation and suppuration of the dura mater, in consequence of external violence, is almost surely indicated, even when the skin is quite free from wound, or other mark of injury, by a puffy, circumscribed, indolent tumour of the scalp, and a spontaneous separation of the pericranium from the skull under the swelling.

It should be understood that none of the bad symptoms are owing to the secession of the pericranium, but to the inflammation of the dura mater. Hence, though the scalp may be so wounded or torn by any accident, as to leave a part of the skull quite bare, the pericranium being separated by the violence, yet if the force has not been such as to affect the dura mater, the alarming train of evils above explained do not follow. Here the best practice is to lay down the scalp in its natural situation again, and give it the opportunity of uniting.

It remains for us to consider the treatment of the respective cases, where there is either danger of an inflammation of the dura mater coming on, or where the affection actually prevails, attended with the formidable symptoms already detailed.

Every man of experience will coincide with Mr. Pott, that of all the remedies in the power of art, for inflammations of membranous parts, there is none equal to pilebotomy, and that if any thing can particularly contribute to the prevention of the ills likely to follow severe contusions of the head, it is this kind of evacuation; but then it must be made use of in such a manner as to become truly a preventive; that is, it must be made use of immediately and freely.

There will often be some difficulty in persuading a person, who has had what may be called only a knock on the pate, to submit to such discipline, especially if he finds himself tolerably well: yet, in many instances, the timely use, or the neglect of this single remedy, makes all the difference between safety and fatality. It is true, that by this method patients must sometimes be bled, who would escape inflammation of the dura mater without such evacuation; yet, let it be remembered, that the loss of blood, however unnecessary in these cases, never endangers life, while it is frequently the means of preserving it. In short, we must agree with Mr. Pott, that if every person who meets with a severe blow on the head were to be bled, as he undoubtedly ought to be, many a very valuable life would be preserved, which, for want of this kind of assistance, is lost. Acceleration, or hardness of pulse, restlessness, anxiety, and any degree of fever, after a smart blow on the head, are always to be suspected and attended to. Immediate, plentiful, and repeated evacuations have, in many instances, removed these complaints in persons, to whom, Mr. Pott believes, very terrible mischief would have happened, had not such precaution been used. From these observations, however, let it not be concluded, that early bleeding will always prove a certain preservative; like all other human means it is fallible; but, if it sometimes fails, it also succeeds to a greater extent than any other known plan.

When the inflammation of the dura mater has produced matter under the cranium, the fluid ought to be discharged through a perforation of the bone. This operation ought always to be done immediately when the above described symptoms manifest the nature of the case. The spontaneous separation of the dura mater, if attended with general disorder of the patient, with chilliness, horripilation, languor, and fever, was invariably considered by Mr. Pott a sure indication of mischief underneath, and an urgent reason for perforating the bone without delay. In some cases one perforation will suffice; in others, more openings must be made. This variation will depend upon the space of detached dura mater, and the quantity of matter collected.

The repetition of blood-letting, of cooling laxative medicines, the use of antiphlogistic remedies, and a most strict observance of a low diet and regimen, are as indispensably requisite after trephining as before. The perforation obviates the dangerous effects of the confinement of matter; but it does nothing more; and the inflamed state of the parts under the skull still calls for our most earnest attention: See Pott on Injuries of the Head.

Fractures of the Skull.—Whenever the head is stricken with a certain degree of violence, the effect is not limited to a vehement concussion of this part of the body, or to the bruising and wounding of the scalp; the bones forming the cranium are also liable to be broken. When the weapon, or thing with which the blow is given, presents an angular or a projecting surface, the fracture generally happens where the violence is immediately applied; but it may occur at a different part of the head, when produced by a body of a certain width. The possibility of fractures happening in a situation more or less distant from that which received the blow, is explicable on the principle of the unequal resistance offered by the parietes of the cranium at different points of their extent. It is to such cases that the name of *counter-fractures* is given.

In order to explain the manner in which counter-fractures are produced, let us suppose a blow to fall upon the os frontis, with a force equivalent to twenty, which bone, being in the situation of the forehead somewhat thick, makes a resistance equal to twenty-five. The solution of continuity,

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ity, therefore, cannot happen directly in the place stricken; the force is transmitted to the orbital process, a part which is thin, easily broken, and only capable of making a resistance expressed by twelve; consequently the violence, though weakened in its transmission, is still sufficient to fracture this last process. The foregoing reasoning coincides with experience. Many fractures of the orbital processes of the os frontis are met with in practice, while that part of the bone, which forms the forehead, remains free from injury. This first species of counter-fracture, though not exactly in the situation where the external violence was applied, happens on a part of the same bone which received the blow. There are other cases, where counter-fractures occur on some bone adjoining that which was stricken, notwithstanding the check which the impulse must experience in crossing the sutures. Thus, blows on the parietal bone frequently break the squamous portion of the os temporis.

Such counter-fractures as happen to a part of the skull, diametrically opposite the point which received the blow, notwithstanding the equal thickness of the bones in both places, admit of explanation by the imperfect spherical form of the cranium. Richerand, *Nosog. Chir.* tom. 2.

Fractures of the inner table of the skull, while the external is simply contused, are explicable by its great fragility, whence it has also been named by several authors *vitreous*.

Direct fractures, as well as counter-fractures, differ in point of situation, the extent of the solution of continuity, their particular shape, and the symptoms with which they are followed. Sometimes the crack is exceedingly fine and minute, which case is often called a *capillary fissure*. Sometimes the edges of the breach are attended with a separation, more or less considerable. In some cases, the fracture runs in a straight line; in others it is stellated. In certain examples, the splinters of bone are beaten inwards, and compress the brain: these instances are usually named *fractures with depression*. On other occasions, the broken pieces keep their proper level. But even in the latter sort of case, the brain may suffer a dangerous degree of pressure from an extravasation of blood under the bone, such pressure, indeed, as may urgently require the application of the trephine. Yet, it ought to be well understood, that this operation is not performed because the skull is broken, but because the brain is dangerously compressed by a quantity of extravasated blood, that lies confined under the bone, and was poured out of vessels, which were ruptured by the same violence as broke the bone itself.

Not only may fractures of the skull be complicated with extravasation, they may be conjoined with the effects of concussion. Depressed fractures are frequently accompanied with an actual laceration of the membranes and substance of the brain. The recoveries which have been known to follow the most terrible wounds of this organ, as detailed in the Memoirs of the French Academy of Surgery, are both curious and surprising. But, generally speaking, the danger of all injuries of the head is in proportion to the mischief and violence done to the brain. A fracture of the skull, could it be occasioned, and exist without the least irritation and disturbance of the brain and membranes thereof, would be attended with no serious symptoms, and, of course, would require only simple treatment. In short, the breach of continuity would be repaired with callus, just like a similar injury in any other bone. It is the nearness of the brain, and the manner in which it is affected, either by the depression or inequality of the bone, or by the blow itself, which constitute at once the importance and danger of all fractures of the cranium. The ignorant and injudicious are

apt to think, that because the skull is broken, the trepan must be employed, as a matter of course. Perhaps the doctrines of M. Quesnay, Pott, &c. might sanction the invariable use of the trephine; for, if the argument be allowed, that this operation is proper as a *preventive* of the bad symptoms to be apprehended in cases of fractured skulls, there cannot very well be any cases where the practice would not be justifiable. Let not an opinion of such consequence, however, be taken up too hastily, and we shall presently adduce convincing reasons against its validity.

We must first consider what are the symptoms by which the existence of a fracture of the skull may be known? It must be acknowledged, considerable obscurity prevails in the diagnosis of such accident, unless it so happen, that the nature of the case admits of being ascertained by the eye, or the touch. What are termed the *rational* symptoms are exceedingly fallacious. When a fracture of the skull occurs, attended with a wound of the scalp, and a denudation of the broken part of the bone, the surgeon may both see with his eyes, and feel with his fingers, what has happened. The existence of a fracture may likewise be ascertained by the touch, even when the soft parts are entire, if the solution of continuity in the bone is splintered, or accompanied with a considerable depression. When several of the fragments are entirely detached, a palpable crepitus will often render the nature of the accident still more clear.

Setting out of consideration such symptoms, there are none which can be regarded as characteristic of a fracture of the skull. Some writers direct us to enquire whether the patient was sensible, at the time of receiving the injury, of any noise, like that of a pot breaking. But how are we to gain information on this point from patients who are always stunned at first, and often remain senseless and speechless a long while afterwards? Other authors lay stress on the bleeding from the nose and ears, a circumstance entirely incidental, or, at most, indicative of nothing else, than that the head has sustained some kind of blow, or concussion, without at all informing us of the degree of violence that has been applied. Besides, every one knows what slight shocks will cause this kind of bleeding in particular persons, so that it cannot be received as a proof that the blow has been very powerful. Even did it prove that the blow has been violent, it would not justify the inference, that the skull is certainly broken. In short, we may assert, that a fracture of the cranium, without depression, without extravasation, and without concussion, is generally not only not productive itself of any alarming effects, but is also unmarked by any particular symptoms. Its existence can only be ascertained by the eye or the touch; and therefore its diagnosis is only easy, when the injury is exposed in consequence of a wound. However, a surgeon need not be solicitous to find out an undepressed fracture; for if symptoms demand the application of the trephine, he is to apply it to the bone, whether it is fractured or not; and if these symptoms are absent, the fracture itself cannot be a just reason for the operation.

We must not take our leave of the diagnosis of these cases, without cautioning surgeons not to be too hasty in pronouncing the skull to be fractured. Bloody tumours of the scalp often feel so much like fractures of the cranium with depression, as to make the most experienced men incapable of a positive decision. These cases have already been noticed in the present article. When the bone is bare, it is possible to mistake a suture, or the furrow of a blood-vessel, for a fracture, and Hippocrates has gained considerable honour

honour by the candour with which he acknowledged his having fallen into an error of this kind.

We shall conclude this subject with a few observations on the treatment of fractures of the skull. For the relief of these cases, there cannot be a doubt that the usefulness of trepanning has been most unreasonably magnified. The necessity of only practising this operation when it is absolutely requisite, must be manifest to every one, who reflects, that cutting away a portion of the skull is a proceeding by no means free from the hazard of very dangerous consequences. We have also the testimony of several eminent surgical writers, that it is an operation, generally speaking, attended with remarkable ill success. It is not our intention, however, to endeavour to insinuate, that the fatal terminations are not chiefly ascribable to the serious mischief which commonly exists when the operation is performed. Be this as it may, we cannot help looking upon trepanning as a thing, to which recourse should never be had without strong and urgent reason. Default, the most eminent of the modern French surgeons, entirely abandoned the operation in the latter years of his practice, as he found considerable success arise from the employment of evacuations. "*C'est une observation fort ancienne, que le peu de succès de l'opération du trépan pratiquée à l'Hôtel-Dieu de Paris; soit, que l'air des salles, vicié par le grand nombre d'individus, qui s'y trouvent rassemblés, ou par l'humidité dont le voisinage de la rivière le charge constamment, exerce sur la place, que succède l'opération, ou sur les membranes du cerveau mises à nu, une influence délétère, soit que ce fait constant dépende d'une autre cause ignorée, l'opération du trépan est presque toujours suivie de la mort des individus.*" Richerand, *Néographie Chirurgicale*, tom. ii. p. 266. Edit. 2.

That the operation of trepanning is itself not exempt from serious danger we most firmly believe. We have seen it prove fatal, when performed with a view of relieving a violent inveterate head-ache. Yet we cannot bring our mind to believe, that Default was right in rejecting the operation altogether. There certainly are cases in which it may be the means of preservation as well as others, in which it may exasperate circumstances and render them fatal.

We have noticed that, in fractures of the skull, the operation of trepanning was advised by Pott, as a *preventive* of ill consequences. It gives us pleasure to state, that this practice is now never adopted by the most eminent surgeons in this country, great as their veneration is for so distinguished an authority. Many modern writers of the highest reputation have forcibly remonstrated against the method, as M. Default, of Paris; Mr. Dease, of Dublin; Mr. Jolin Bell, of Edinburgh; and Mr. Abernethy, of London.

The reader cannot be surprised, that fractures without depression are not, abstractedly considered, a just cause for trepanning, when he is informed, that the skull is often broken and depressed, and yet the symptoms may not be such as to demand the operation, and the patient has the best chance of recovery when it is not performed. The more the present subject is studied, the greater will be the conviction, that there is only one genuine reason for trepanning, and that is, when symptoms of a dangerous degree of pressure on the brain exist, which symptoms are enumerated under the head of *EXTRAVASATION*. When they prevail, the operation is to be done, whether the skull is broken or not; whether it be depressed or retain its proper level.

Mr. Abernethy has related several cases of fracture of the cranium with depression, which terminated favourably, although no operation was performed. This judicious su-

geon thinks, that these cases, as well as a great many others on record, prove, that a slight degree of pressure does not derange the functions of the brain for a limited time after its application; and all those patients whom he had an opportunity of knowing for any length of time after the accident, continued as well as if nothing of the kind had happened to them. In Mr. Hill's Cases in Surgery, two instances of this sort are related, and Mr. Hill knew both the patients for many years afterwards; yet no inconvenience arose. Indeed, it is not easy to conceive that the pressure which caused no ill effects at a time when the contents of the cranium filled its cavity entirely, should afterwards prove injurious when they have adapted themselves to its altered size and shape. Severe illness, it must be confessed, does often intervene between the receipt of the injury and the time of recovery; and many surgeons might be inclined to attribute this to the pressure on the brain; but it occurs quite as formidably when the depressed portion is elevated. If a surgeon, prepossessed with the opinion, that elevation of the bone is necessary in every instance of fracture of the skull with depression, should have acted upon this opinion in several of the cases which Mr. Abernethy has related, and afterwards have employed proper evacuations, the patients would probably have had no fatal symptoms, and the recoveries would naturally have been imputed to the particular mode of treatment; yet these cases ended well without any operation.

It cannot be too often repeated, that the necessity of trepanning depends entirely on the urgency of the symptoms, which are known to proceed from the existence of pressure on the brain. (See *EXTRAVASATION*.) To trepan the skull merely because it is broken, is as absurd as to cut the arm because it is fractured: it is only adding one species of violence to another. We have seen that, even when the fracture is depressed, it does not necessarily follow that the operation is proper: in fact, it is always improper, unless there are evident signs that the degree of pressure, thus produced, is the cause of existing dangerous symptoms.

If, then, fractures of the cranium with depression do not invariably require trepanning, it may readily be conceived, that the operation must be still less frequently necessary when the fracture is undepressed. In such case, indeed, the fracture itself can never demand this proceeding. But, nevertheless, it may be right and indispensable on other accounts, since the brain may at the same time be dangerously compressed by an extravasation of blood, or, in the course of the disorder, by matter formed under the skull in consequence of inflammation. However, it should be well understood, that the inflammation and suppuration of the parts beneath the skull, which Mr. Pott was so anxious to prevent by trepanning early, do not arise from the occurrence of a breach in the cranium, but are chiefly, if not altogether, the consequences of the same violence, which was the occasion of the fracture. Hence, it is obvious, that removing a portion of the bone cannot have the least tendency to prevent the inflammation and suppuration, which must inevitably result from the external violence that was first applied to the head; but, on the contrary, such a removal being an additional violence, must rather have the effect of increasing the unavoidable inflammatory mischief.

A fracture of the skull, unattended with urgent symptoms, and not brought into the surgeon's view by any accidental wound of the integuments, often remains for ever undiscovered and unknown; and as no benefit could arise from laying it bare by an incision, such practice should never be adopted. The practitioner ought only to make himself

officious in this way, when he can accomplish by it some better object than the merely satisfying his own curiosity. Now, since the removal of pressure off the surface of the brain is the only admissible reason for ever perforating the cranium, and since dividing the scalp cannot be useful, unless preparatory to such operation, it is clear that neither the one nor the other should ever be done, excepting such symptoms exist as unequivocally denote the prevalence of a dangerous degree of pressure on the brain, caused either by matter, extravasated blood, or depressed portion of the skull.

The true mode of *preventing* the bad effects frequently following, but not arising from simple fractures of the skull, (by which we mean cases unaccompanied by urgent symptoms of pressure,) is not to trepan, but to put in practice all kinds of antiphlogistic means. For this purpose, let the patient be repeatedly and copiously bled, both in the arm and temporal arteries; let him be properly purged; give him antimonials; keep him on the lowest diet; let him remain in the most quiet situation possible; and if, notwithstanding such steps, the symptoms of inflammation of the brain continue to increase, let his head be shaven, and a large blister be applied to it. When, in spite of all these measures, matter forms under the cranium, attended with symptoms of pressure, a puffy tumour of the injured part of the scalp, or those changes of the wound (if there be one), which Mr. Pott has so excellently described, and we have already related; not a moment should be lost in delaying to perforate the bone with a trephine, so as to give vent to the matter collected underneath.

Before concluding, we have one important caution to offer, which is, in all cases of injuries of the head from external violence, to continue an antiphlogistic regimen at least a month after any serious accident of this description; for it is by no means uncommon for inflammation of the brain to follow injuries of the head a very considerable time after the patients have had reason to fancy themselves in perfect safety. Pott on Injuries of the Head; Disease on Wounds of the Head: Hill's Cases in Surgery; Abernethy on Injuries of the Head; Cooper's Dictionary of Practical Surgery, &c.

Other subjects, immediately connected with the preceding, will be found under the articles COMPRESSION, CONCUSSION, EXTRAVASATION, and TREPPANNING.

INK, a liquor wherewith to write on paper or parchment.

INK, Printing. See PRINTING.

INK, Writing, is commonly made of copperas and galls, and gum arabic; but other astringent plants may serve the same purpose; such as oak-bark, red roses, logwood, or sumach. Mr. Boyle seems to doubt whether all astringent vegetables will do the same.

Many are the preparations and methods of compounding the materials for making of writing ink. For many years the ink most generally used by European writers has been the infusion of galls and other astringent vegetables, containing gallic-acid, rendered black by sulphate of iron, and thickened by the addition of a little gum or sugar. This composition, however, is liable to fade; but since the discovery of the method of totally discharging the traces of common ink by the application of the oxygenated muriatic acid, more serious consequences are to be apprehended from the universal use of the common atramentous fluid, than the decay of its colour from age; for it is well known that, while the sulphate of iron remains on the paper, the colour of the writing may be restored by washing the MS. with fresh infusion of galls. We have several receipts in Nichol-

son's Philosophical Journal, vol. iv. p. 479, 4to., for composing ink capable of resisting the oxygenated muriatic acid.

Macquer, in the Chemical Dictionary, gives the following receipt for making good ink. In four French pints of common water or beer, let a pound of bruised galls be infused twenty-four hours without boiling; to this add six ounces of gum-arabic; and when the gum is dissolved, six ounces of green vitriol, which will soon give it the black colour; the liquor is then to be strained through a hair-sieve.

The following method has been recommended by experience, and is easily and speedily practised. To a gallon of boiling water, put six ounces of blue galls, grossly pounded, and three ounces of copperas; stir the mixture well together, and then add six ounces of gum arabic pounded. After stirring the whole thoroughly, leave it to settle, and the next day strain it off from the dregs for use. See *IRIS lutea palustris*.

The following composition will make a very good black writing ink. Take a gallon of soft water, and boil in it a pound of chips of logwood for about half an hour; pour the decoction boiling hot on a pound of the best Aleppo galls powdered, and two ounces of pomegranate-peels, put into a proper vessel. After having stirred them well together with a wooden spatula, place them in the sunshine in summer, or within the warmth of any fire in winter, for three or four days, stirring the mixture occasionally; then add half a pound of green vitriol powdered, and let the mixture remain four or five days more, occasionally stirring it; and then add four ounces of gum arabic dissolved in a quart of boiling water; and after the ink has settled, strain it off through a coarse linen cloth, and keep it well stoppered for use.

Mr. Delaval in his "Treatise on Colours," p. 37: informs us, that with an infusion of galls and iron filings, he had not only made an exceedingly black and durable ink, but by means of it, without the addition of any acid, dyed silk and woollen cloth of a good and lasting black. But this kind of ink, though the colour is far superior to that of any other, may be easily discharged, either by the smallest quantity of any acid, or even by simple water; because it doth not penetrate the paper in such a manner as is necessary to preserve it from the instantaneous action of the acid or of the water. During the action of the infusion of galls upon the iron in making this kind of ink, a very considerable effervescence takes place, and a quantity of air is discharged, the nature of which has not yet been examined.

Many of the more volatile kinds of oil may be used in writing, if reduced to a proper consistence by the addition of gum or resin. Tolerable ink may be made by dissolving 30 grains of common resin in 90 grains of oil of turpentine, and tempering the solution with $17\frac{1}{2}$ grains of lamp-black, and $2\frac{1}{2}$ of indigo. In a dry state, this composition resists the action of water, but not of spirit. Copal is much superior to resin; it will dissolve in only few liquids. It may be dissolved, however, in oil of lavender. The only inconvenience attending the use of copal in the composition of ink is, that it is soluble at a low temperature. Ink may be composed of oil of lavender, copal, and lamp-black in the manner following: Take oil of lavender 200 grains, copal, in powder, 25 grains, and lamp-black from $2\frac{1}{2}$ to 3 grains. With the assistance of a gentle heat, dissolve the copal in the oil of lavender in a small glass phial, and then mix the lamp-black with the solution upon a marble slab, or other smooth surface. Put the composition into the bottle, and keep it from the air. After the repose of some hours, the ink must be

well shaken, and stirred with a piece of wire before it is used ; if it be too thick, it must be diluted with a little oil of lavender, oil of turpentine, or alcohol. The facility of writing with this composition depends much on the quantity of the colouring matter. *Nicholson's Journal*, vol. ii. 8vo.

As the duration of records, and other valuable writings, depends much on the goodness of the ink employed, Dr. Lewis has thought this subject worthy of his attention. The chief imperfection of common inks is, that they decay in time, and at last the writing becomes invisible. From experiments made by that author, he infers, that the decay of inks is chiefly owing to a deficiency of galls ; that the galls are the most perishable ingredient, the quantity of these, which gives the greatest blackness at first (which is about equal parts with the vitriol) being insufficient to maintain the colour ; that for a durable ink, the quantity of galls cannot be much less than three times that of the vitriol ; that it cannot be much greater without lessening the blackness of the ink ; that by diminishing the quantity of water, the ink was rendered blacker and more durable ; that distilled water, rain water, and hard spring-water, had the same effects ; that white wine produced a deeper black colour than water ; that the colour produced by vinegar was deeper than that by wine ; that proof spirit extracted only a reddish-brown tinge, and rectified spirit a paler brown ; that the last mentioned tinctures sunk into, and spread upon the paper ; and hence the impropriety of adding spirit of wine to ink, as is frequently directed, to prevent mouldiness or freezing ; that other astringents, as oak bark, bistort, sloe-bark, &c. were not so effectual as galls, nor gave so good a black, the colour produced by most of these, excepting oak-bark, being greenish ; that the juice of sloes did not produce a black colour with martial vitriol ; but that, nevertheless, the writing made with it became black, and was found to be more durable than common ink ; that inks made with saturated solutions of iron in nitrous, marine, acetous acids, in tartar, or in lemon juice, were much inferior to the ink made with martial vitriol ; that the colour of ink was depraved by adding quicklime, which was done with an intention of destroying any superabundant acid which might be supposed to be the cause of the loss of the colour of the ink ; that the best method of preventing the effects of this superabundant acid is probably by adding pieces of iron to engage it ; and that this conjecture was confirmed by an instance the author had heard, of the great durability of the colour of an ink in which pieces of iron had been long immersed ; and lastly, that a decoction of logwood used instead of water, sensibly improved both the beauty and deepness of the black, without disposing it to fade. The same author observes, that the addition of gum arabic is not only useful, by keeping the colouring matter suspended in the fluid, but also by preventing the ink from spreading, by which means a greater quantity of it is collected on each stroke of the pen. Sugar, which is sometimes added to inks, was found to be much less effectual than gums, and to have the inconvenience of preventing the drying of the ink. The colour of ink is found to be greatly injured, by keeping the ink in vessels made of copper, or of lead, and probably of any other metal excepting iron, which the vitriolic acid can dissolve. The foregoing experiments point out for the best proportions of the ingredients for ink ; one part of green vitriol, one part of powdered logwood, and three parts of powdered Aleppo, or blue galls. The best menstruum appears to be vinegar or white wine, though for common use water is sufficient. If the ink be required to be of a full colour, a quart, or at most three pints, of liquor may be allowed to three ounces of galls, and to one ounce of each of the

other two ingredients. Half an ounce of gum may be added to each pint of the liquor ; though the more gum we can employ, consistently with due freedom of writing, it is probable that the ink will be the more durable. The ingredients may be all put together at once in a convenient vessel, and well shaken four or five times each day. In ten or twelve days the ink will be fit for use, though it will improve by remaining longer on the ingredients ; or it may be made more expeditiously, by adding the gum and vitriol to a decoction of galls and logwood in the menstruum. To the ink, after it has been separated from the feculencies, some coarse powder of galls, from which the fine dust has been sifted, together with one or two pieces of iron, may be added, by which its durability will be secured.

It has been often remarked, says the same ingenious writer, that the inks used in former times were far more durable than those of later years ; many modern records being more decayed than manuscripts of much greater antiquity, of which we have instances in the *Letters of Camillo Paderni*, published in the *Philosophical Transactions* for 1753 and 1754. Dr. Lewis made several experiments, in order to recover the composition of this durable ink. Instead of oil which is used in the printers' ink, he mixed both lamp-black and ivory-black with a solution of gum arabic ; this liquor wrote of a fine black colour, but when dry, it rubbed off entirely by moisture. Concluding, therefore, that the colour could not be sufficiently fixed on paper without an oily cement, and as oils are made miscible with watery fluids by the intervention of gum, he mixed some of the softer printers' varnish with about half its weight of a thick mucilage of gum arabic, working them well together in a mortar, and beat this mass with lamp-black, adding water by little and little, and continuing the rubbing, till the mixture became of a due consistence for writing. This produced characters of a full brownish black colour, which could not be discharged by rubbing, nor washed out so readily as the foregoing. Instead of the printers' varnish, or boiled oil, linseed-oil was mixed in the same manner with mucilage and lamp-black, and the mixture diluted with water ; and the ink thus obtained was much the same as the other. To prevent the discharge by water, some of the more sinking kinds of paper, or common paper made damp as for printing, must be used, which will admit the ink to sink a little into its substance ; and thus the characters will be as fixed as can be desired. Such Dr. Lewis found to be the ancient inks, that were so durable. Pliny and Vitruvius expressly mention the preparation of foot, or lamp-black, and the composition of writing ink from lamp-black and gum. Dioscorides sets down the proportion of three ounces of the foot to one of gum. This mixture was formed into cakes or rolls, and dried in the sun, which were occasionally tempered with water, as the Indian ink is with us for painting. The ancients were sensible that these inks were liable to be discharged by water, and endeavoured to obviate this imperfection, according to Pliny, by using vinegar, instead of water, for tempering the mixture of lamp black and gum, which promotes the sinking into the paper. After all, none of these inks can be discharged otherwise than by design ; which is the case with respect to the vitriolic inks, and those of printed books and copper-plates.

In the course of Dr. Lewis's experiments, a farther improvement occurred to him, which was that of using the common vitriolic ink, instead of water, for tempering the ancient mixture of gum and lamp-black. By this method the writings will have the durability of those of former times, with all the advantage that results from the vitriolic ink fixing itself in the paper. Common writing ink may, in

many cases, be improved by a small addition of the ancient composition, or of the common Indian ink. Lewis's Commerce of Arts, &c. § 16.

Mr. Aistle, in his "Origin of Alphabetical Writing," inculcates the necessity of making ink durable; and for this purpose suggests a comparison of the rolls and records that have been written from the 15th century to the end of the 17th, with the writings that remain from the 5th to the 12th centuries. These are in excellent preservation; but the former, though of more modern date, are defaced to such a degree that they are scarcely visible. Mr. Aistle agrees with Dr. Lewis in the opinion, that the ancient inks were composed of foot or ivory black instead of the galls, copperas, and gums, which form the composition of our's. Besides their black ink, the ancients used various other colours, as red, gold and silver, purple, &c. Green ink was frequently used in Latin MSS., especially in the latter ages: and it was frequently employed in signatures by the guardians of the Greek emperors till their wards were of age. Blue or yellow ink was seldom used except in MSS., but, according to Mr. Aistle, the yellow has not been much in use for these 600 years. Some kinds of characters, particularly the metallic, were burnished. Wax was used by the Latins and Greeks as a varnish, especially by the former, and particularly in the 9th century. This continued a long time in vogue. Dr. (Sir Charles) Blagden, in the Phil. Transf. vol. lxxvii. p. 451, &c. has proposed a new method of recovering the legibility of decayed writings. With this view he made some experiments on parchment and vellum MSS., with which he was furnished by Mr. Aistle, employing those chemical re-agents which seemed best adapted to his purpose, viz. alkalies, both simple and phlogisticated, the mineral acids, and infusion of galls. The general result shewed, that the ink anciently used, at least in these MSS., was of the same nature as the present; and the greater durability of the more ancient inks appeared to depend very much on a better preparation of the material upon which the writing was made, viz. the parchment or vellum. He suspected, however, that the ancient inks contained a rather less proportion of iron than the more modern; and perhaps more gum was used then, or possibly they were washed over with some kind of varnish, though not such as gave any gloss. It occurred to our author, in the course of his experiments, that perhaps one of the best methods of restoring legibility to decayed writings might be to join phlogisticated alkali with the remaining calx of iron. In order to bring this idea to the test, he made several experiments, for which we refer to his paper, *ubi supra*. The method now commonly practised to restore old writings is the wetting of them with an infusion of galls in white wine. This has certainly a great effect: but, like the phlogisticated alkali, it is apt to stain the substance in which the writing was made. Sir Charles Blagden suggests, that a phlogisticated alkali, better adapted to this purpose than the common, might be prepared, by rendering it as free as possible from iron, diluting it to a certain degree, or substituting the volatile alkali for the fixed. This would serve to bring out a prodigious body of colour upon letters which were before so pale as to be almost invisible, and it would be preferable to the infusion of galls in this respect, that it produces its effect immediately, and may be confined to those letters only for which such assistance is wanted.

In the "Monthly Review" of the volume of Transactions above cited, the following method is proposed for preventing ink from decaying. It consists in washing over the paper on which the writing is to be made with the colouring matter of Prussian blue; and by writing upon it afterwards with

common ink, a ground of Prussian blue is formed under every stroke; which will remain strong after the black has been decayed by the weather, or destroyed by acids. The ink will thus bear a larger proportion of vitriol at first, and will have the advantage of appearing blacker when first written.

INK Powder may be prepared, by infusing a pound of galls powdered, and three ounces of pomegranate-peels, in a gallon of soft water for a week, in a gentle heat; and then straining off the fluid through a coarse linen cloth. Add to it eight ounces of vitriol dissolved in a quart of water, and let them remain for a day or two; preparing in the mean time a decoction of logwood, by boiling a pound of the chips in a gallon of water, till one-third be wasted, and then straining the remaining fluid while it is hot. Mix this decoction and the solution of galls and vitriol together, and add five ounces of gum arabic, and then evaporate the mixture over a common fire to about two quarts; when the remainder must be put into a vessel proper for that purpose, and reduced to dryness in *balneo Marie*, i. e. by hanging the vessel in boiling water. The remaining mass, after the fluid is wholly exhaled, must be well powdered; and when it is wanted for use, may be converted into ink by the addition of water.

A portable or extemporaneous ink may be made without galls or vitriol, by mixing half a pound of honey and the yolk of an egg, adding two drams of gum arabic finely levigated, and thickening the whole with lamp-black to the consistence of a stiff paste; which being put to a proper quantity of water, may be used as an ink.

INK, *Indian*, or *Chinese*, is an admirable composition, in vain attempted to be imitated in Europe. It is not fluid, like our writing inks, but solid, like our mineral colours, though much lighter. They make it of all figures, but the most usual is rectangular, about a quarter of an inch thick. Some of the sticks are gilt with figures of dragons, birds, flowers, &c. In order to do this, they have little wooden moulds, so curiously wrought, that we could hardly equal them in metals.

To use this ink, there must be a little hollow marble, or other stone, with water in it, on which the stick of ink must be ground, till the water becomes of a sufficient blackness. It makes a very black shining ink; and though it be apt to sink when the paper is thin, yet it never runs or spreads; so that the letters are always smooth, and evenly terminated, how big soever they be. It is of great use in designing, because it may be weakened or diminished to any degree; and there is abundance of things which cannot be represented to the life without it.

From an analysis of this ink, Dr. Lewis concludes that it contains an animal substance soluble in water, and consists of a black powder, mixed with some animal glue. He tried to imitate it, by mixing some lamp-black, prepared from linseed-oil, by hanging a large copper pan over the flame of a lamp to receive its smoke with as much melted glue as gave it sufficient tenacity for being formed into cakes. These cakes, when dry, answered as well as the genuine Indian ink, in regard both to the colour, and the freedom and smoothness of working. Ivory black, and other charcoal blacks, levigated very fine, had the same effect with the lamp-black. It appears from three receipts for the preparation of Indian ink, in Du Halde's History of China, that the colouring material is lamp-black, to which is added, in one of them, a quantity of horse-chestnuts, burnt till the smoke ceases. The conglutinating matter, in one of the prescriptions, is a thin size of neat's leather; in another, a solution of gum tragacanth, and in the other, a mixture of size, with a decoction

coction of certain vegetables, unknown to us. Du Halde observes, that the Chinese have inks of different goodness and price; that the most essential difference proceeds from the quality of the lamp-black, and that the best is the foot of oil, burnt in lamps, in apartments fitted up for this purpose.

The Chinese have often attempted to use this in their porcelain, to give the colour of black to the figure traced on white vessels, but it has been a vain attempt; for however beautiful and strong the figures might appear when first laid on, and even when the vessels were dried, it all disappeared on the baking, and they came out quite white as they were put in. The colours for this use must be such as can penetrate the varnish, and endure the fire. Mineral colours are found to have these qualities, and these alone therefore are to be employed; such light ones as this black burning off from the surface, and wholly disappearing. *Obs. sur les Coutumes de l'Asie*, p. 329.

INK is also an appellation given to any coloured liquor used in the same manner as black ink; as red, green, blue, yellow, &c. inks. *Red writing ink* is prepared by infusing a quarter of a pound of the raspings of Brazil wood for two or three days in vinegar; boiling the infusion for an hour over a gentle fire, and afterwards filtering it, while hot, through paper laid in an earthen cullender; then put it again over the fire, and dissolve in it, first, half an ounce of gum arabic, and afterwards alum, and white sugar, of each half an ounce. *Red ink* may be also made of vermilion, by beating together the glair of four eggs, a tea-spoonful of white sugar, or sugar-candy, powdered, and as much spirit of wine, till they be of the consistence of oil; then adding such a proportion of vermilion as will produce a red colour of sufficient strength; the mixture should be kept in a small phial, or well-stopt ink bottle, and well shook before it be used. Gum-water is often used instead of the glair of eggs; but thin size made of isinglass, with a little honey, is much better for the purpose. *Red ink* may be made by tempering the solution of copal with red sulphuret of mercury, e.g. take of oil of lavender, 120 grains, copal, in powder, 17 grains, and red sulphuret of mercury, 60 grains, dissolve the copal in the oil, and then mix the sulphuret with the solution upon a smooth surface. This, and also the black ink made with copal, possess a permanent colour, and other essential properties of the ink used in printing. The oil of lavender being dissipated with a gentle heat, the colour is left on the paper surrounded with copal, a substance insoluble in water, in spirits, in acids, or in alkaline solutions.

For red printing ink, see PRINTING.

Green ink may be made, by putting an ounce of powdered verdigris to a quart of vinegar, and straining the fluid, after it has stood two or three days: or, instead of this, the crystals of verdigris dissolved in water will answer the purpose; then dissolve in a pint of either of these solutions, five drams of gum arabic, and two drams of white sugar.

Blue ink is made by grinding indigo with honey and the white of eggs, and making it fluid with water.

Yellow ink is made by an infusion of saffron in water, with a little alum and gum arabic: or, by boiling two ounces of Avignon, or French berries, in a quart of water, with half an ounce of alum, till one-third of the fluid be evaporated, and then dissolving in it two drams of gum arabic, and one dram of sugar, and afterwards a dram of powdered alum.

In general, inks of all colours may be made by using a strong decoction of the ingredients used for dyeing, mixed

with a little alum and gum arabic. See the several colour BLUE, GREEN, &c.

INKS, Sympathetic, or Secret. Every sort of liquor with which a person may write, so that the letters do not appear till there is some particular means used to give them a colour different from that of the paper, is called by the name of *Sympathetic ink*; and of this there are a great many kinds described in the writings of Baptista Porta, Lemery, and other authors.

All these inks may be regularly distributed into different classes, according to the different means which are to be used to make them appear; and these are in general the four following. 1. By giving a new liquor, or the vapour of new liquor, a place on the paper, on which the letters are written with the natural invisible ink. 2. By exposing the paper to the air, by which means the letters at first invisible will appear. 3. By passing gently over the letters a matter of some remarkable colour reduced to fine powder. And 4. By exposing the paper to the fire.

This last is by much the best method, and is so general, that it may be prudently used to all papers suspected of containing any secret writing, as it seldom fails to discover it. All the common inks of this kind, however, when they have been once made to appear, either by fire or by any other method, can never be made to disappear again; but there is one kind described by Mr. Hellot, in the *Memoirs of the Academy of Sciences at Paris*, and since tried many times with us, and elsewhere, which, though the letters it gives are in themselves invisible, and appear like those of some other of these inks, on their being held to the fire, yet they after that will fade and disappear on the paper again, and may be reproduced in this manner several times. This, therefore, is the first known ink of a fifth general class, of which future researches may discover perhaps more.

Of the first class of sympathetic inks, or those which do not appear till the paper on which they are written be made to imbibe another liquor, or the vapour of another liquor, are the following kinds.

To two or three parts of unslaked lime put one of yellow orpiment; powder and mix the two, adding fifteen or sixteen times as much water as there was orpiment; stop up the phial with a cork and bladder, and set it in warm embers; shake the phial now and then for five hours, and warily decant the clear part, or rather filtrate it. In the room of this preparation may be used a saturated solution of common brimstone, made by boiling the brimstone either with quicklime, or in strong alkaline ley. In the mean time, burn a piece of cork thoroughly, and when well inflamed, quench it in common water, or rather in brandy. Being thus reduced into a friable coal, grind it with fair water, wherein gum arabic has been dissolved; and it will make a liquor as black as the common ink.

While these are doing, dissolve, in three times as much distilled or strong vinegar, over warm embers, a quantity of red lead, or of saccharum saturni, in thrice the quantity of water, for three or four hours, or till the liquor have a sweet taste. This liquor will be as clear as common water. Solutions of lead in aquafortis answer the same end, except that, when written with, they are apt to corrode the paper.

The liquors thus prepared, write any thing on paper with this last sort, dry it, and nothing will appear. Over the place, write what you please with the second liquor: it will appear as if written with common ink: when dry, dip a small piece of rag or sponge, in the first liquor, rub it over the written place, and the black writing will vanish; and that wrote with the invisible ink will appear black and legible.

Again

Again, take a book four or five inches thick, and on the first leaf write any thing with the last liquor; turn to the other end of the book, and rub there, with a rag, dipt in the first liquor, on that part, as near as you can guess, opposite to the writing, and leave also the rag there, clapping a paper over it; then nimbly shutting the book, strike four or five smart strokes thereon with your hand, and turning the other side uppermost, clap it into a press, or lay it under a good weight for a quarter of an hour, or even half that time; then will the writing done with the invisible ink be found legible there.

The above operation may be varied, by writing the invisible characters with the solution of bismuth in nitrous acid, and exposing them to the vapours of liver of sulphur, or moistening them with a solution of liver of sulphur.

Dissolve white or green vitriol in water, and writing with the solution, nothing will appear. Boil galls in water, and dip a linen rag in the decoction, and with it rub the place before writ, and it will appear black and legible. Rub it over again with spirit of vitriol, or its oil, and the writing will disappear again; rub it over again with oil of tartar per deliquium, the letters will appear again, but of a yellow colour. If the blackness of ordinary ink be destroyed by a sufficient quantity of nitrous acid, the writing made by it will remain invisible till it be moistened with liquid fixed alkali.

The golden sympathetic ink.—This is made by dissolving in aqua regia as much gold as that menstruum can take up, and then adding to the liquor five or six times as much water; in another vessel there must be some tin dissolved in aqua regia; and when that menstruum has also taken up as much of the metal as it can, there is to be added to it an equal quantity of common water. The letters must be written on white paper with the solution of gold, and the writing being dried in the shade, the letters will not appear, at least not for seven or eight hours afterwards; dip a pencil in the solution of tin, and rub that over the solution of gold with which the letters were written, and they will appear of a beautiful purple. It might be supposed, that any other metals which were soluble in the same acid menstruum would equally produce this effect; but experiment shews, that this is not the case; and silver and copper, though both soluble in aquafortis, yet produce no change of colour by these precipitations made by mixing the solutions of them on paper; and this example of such an effect in the solutions of gold and tin, is an exception to the general rules in the solutions of metals, and their effects on one another.

The purple colour of these letters may be again effaced by rubbing some simple aqua regia over the paper, and may be made to appear again by rubbing over that the solution of tin. Kunkel, Cassius and Orschal, with some other writers, made the first steps towards this discovery, by their attempt to give crystal, by means of gold, the colour of the oriental rubies. There are, beside these mineral preparations, some vegetable ones, which give the same phenomena, but these are the more certain.

Of the second kind of sympathetic inks, or those which appear on being exposed only to the air, is the golden ink made by adding to a solution of gold in aqua regia, so much water that the liquor shall not stain a white paper: letters written with this will not appear till the paper has been exposed some hours to the open air, and they will then begin to acquire a colour by degrees, till they at length become of a deep violet colour, tending to black. If, instead of exposing the paper to the air, it be kept in a box close shut up, or closely folded in other paper, it will remain invisible two

or three months; but at the end of that time it will begin to appear, and will by degrees become of a deep violet colour. So long as the gold remains united to its dissolvent, it is yellow; but the acid that dissolves it being of a volatile nature, the greater part of it evaporates, and leaves no more than is just necessary to colour the calx of gold which remains upon the paper.

The second of these is the silver ink, made by a solution of silver in aquafortis, weakened by distilled water, till it will not stain the paper. Letters written with this will be invisible for three or four months, if shut up in a box; but if they be exposed to the sun they become legible in about an hour, because by this means the evaporation of the acid is accelerated. The letters written with this ink are of a slate colour; and that from the sulphureous nature of the aquafortis, every thing that is sulphureous blackening silver. This blackish colour, however, is not permanent; for the sulphureous part finally evaporating, the letters are left to their natural appearance, and are of a fine true silver colour, if the silver that was used was fine, and the place open.

In this class there may also be placed several metallic dissolutions; as that of lead in vinegar, and of copper in aquafortis, which give at length a brownish colour upon the paper; as also the solution of tin in aqua regia, of mercury in aquafortis, of iron in vinegar, of emery and several of the pyrites in spirit of salt. But all these, though they give letters which are after some time legible, on being exposed to the air, are also made to appear instantly on the paper, holding them to the fire. Each of these solutions gives its own particular colour; but they have all this disadvantage, that in time they eat away the paper, and the letters are seen in the shape of so many holes.

Of the third class of ink, or that which appears on rubbing over the paper with a brown or black powder, are almost all the glutinous expressed juices of plants, which are themselves of no remarkable colour, the milk of animals, or any other thick and viscous fluids. To use these, the letters must be written on a white paper, and when dry, there is to be thrown over them the fine powder of any coloured earth, or other such substance; and the writing will afterwards appear coloured, because its viscous quality remains sufficiently in it for the entangling and retaining this fine powder, though it falls easily off from every other part of the paper. Mem. Acad. Science, Par. 1737.

Among the methods which Ovid teaches young women to deceive their guardians, when they write to their lovers, he mentions that of writing with new milk, and of making the writing legible by coal-dust, or foot.

“Tuta quoque est, fallitque oculos, e lacte recenti
Litera: carbonis pulvere tange: leges.”

De Arte Amandi, l. iii. v. 629.

Ausonius proposes the same means to Paulinus, and he afterwards teaches other methods of secret writing. Auson. Epist. xxiii. v. 21, &c. Eneas, in Poliorceticis, cap. 31, and Gellius, lib. xvii. cap. 9, mention the like. Pliny, lib. xxvi. cap. 8. mentions the milky sap of certain plants for a similar purpose.

Of the fourth class, or those inks which become visible on holding them to the fire, there are a vast number; and indeed all infusions; the matter of which is readily burnt to a sort of charcoal by a little fire, will answer this purpose. The nicest of this kind is the sal ammoniac ink, made by dissolving a scruple of sal ammoniac in two ounces of fair water. Letters written with this solution are invisible on the paper, till it is held before the fire, or has an iron

iron a little heated passed over it. The rationale of this is, that the inflammable part of the sal ammoniac is burnt to charcoal by a heat which is not sufficient to scorch the paper; and this is the case with all the rest of this class. The letters written with this solution are, however, of no great duration; for the salt being apt to moisten in the air, the letters soon spread, and run together in a confused manner.

Dr. Lewis says, that all the salts which he has tried produce this effect in a greater or less degree; nitre, alum, tartar, very weakly; sea-salt more strongly; fixed alkaline salts still more so; but sal ammoniac the strongest of all. Metallic solutions, made in acids, and diluted so as not to corrode the paper, act in the same manner. The juice of lemons and milk have also been used as sympathetic inks, the writing with which appears upon the application of heat sufficient to decompose the oily and mucilaginous parts of these liquors.

The fifth class of sympathetic ink contains only one yet known kind.

This, though in itself invisible, becomes of a blueish green when held to the fire; and this colour disappears again as the paper cools, and is to be produced again on holding it again to the fire; and this for a long time, and a repeated series of trials. It may also, according to the different manner of treating it, be made to appear blue, green, yellow, red, and some other colours. This property of the tinging-matter of bismuth ore was published at full length by a German lady, in 1705.

A certain German chemist shewed the academy at Paris a salt of rose-water, which became blue on holding it to the fire, and at the same time shewed the ore from which he procured the salt, which he called an ore of marcasite, a name given by many to the bismuth ore. He added, that this was the mineral from which the fine blue smalt of Sneeberg was prepared, and that no other ore but this afforded it, and that he made the tincture from this mineral with aquafortis, which he fixed with sea-salt.

This was the substance of what the German declared, and from what Mr. Hellot, in 1736, took the hint for his discovery of this remarkable ink. The salt was, after many experiments, at length found to be produced from an arsenic ore; and it was found, that all the cobalts and ores of bismuth afford a tincture capable of these changes by fire.

The method of preparing it is this: pour upon two ounces of arsenic ore, grossly powdered, a mixture of five ounces of aquafortis, and five ounces of common water. After the first ebullition is over, place the vessel in a gentle sand-heat, and let it stand there till no more air-bubbles seem to ascend; after this increase the fire, so as to make the liquor boil for about a quarter of an hour; after this the liquor will become of a reddish colour, and when cold it is to be decanted clear off from this sediment into a phial; and after standing in that some time, it is to be again decanted off from what is precipitated there; and so on for three or four times till it is quite clear; for it must not be filtered, lest the acid should take something from the paper that might spoil the effects. When the liquor is clear, there must be added to it two ounces of white sea-salt: this mixture is to be evaporated over a gentle sand-heat, till there remains only a dry saline mass. When the liquor is grown hot, it changes from its orange colour to a fair red; and when the aqueous humidity is evaporated, it becomes of a beautiful emerald colour, and from this, as it dries up, it changes by degrees to a dirty green, like that of verdigris in the cake. As it becomes nearly dry,

it must be stirred about with a glass rod or pestle, to keep it from uniting into a mass; and it must not be kept over the fire till perfectly dry, because by that means the colour is often lost, and the salt from green becomes of a dusky yellow; but if it be taken from the fire while it is green, it gradually becomes reddish as it cools, and finally is of a rose-colour. The manner of using this sympathetic ink is this: write with it on a fine and smooth paper, or draw with a black-lead pencil the figure of a plant or tree on the paper; then trace over the same lines with this liquor; let it dry in the open air, and then rub off the black lines with bread, and the paper will appear altogether fair, though the lines made by the ink are in reality sunk deep into it. On holding this paper to the fire the lines will all appear, and the figure of the plant or the letters will be painted in a beautiful blueish green, which will continue so long as the paper is warm; but when it is cold again, they will wholly disappear. The lines, therefore, disappear much sooner in winter than in summer; and in very hot weather it is often necessary to lay the paper on a marble, or other very cold body, in order to produce this effect. At any time, if the paper be scorched in the experiment, the colour of the lines will not disappear again, even if ice be laid upon them. If the writing be exposed for three or four days to a humid air, the lines will appear of a fine pale red. If the impregnation of the ore of bismuth, instead of sea-salt, have alum added to it, and the whole process be continued as before described; and if letters be written with the red liquor as it is taken out of the vessel, the letters will not appear even on holding it to the fire; but if the paper be wetted over with a clear solution of marine salt, and then left to dry, and afterwards held to the fire, the letters will appear blue. The same also will be the effect, if the writing be exposed to the vapour of hot spirit of salt. When this preparation is thus made with alum, instead of common salt, the liquor never becomes green, but continues red, and never changes colour in the drying, or afterwards. The green colour seems to be wholly the effect of the sea-salt; for not only this aluminate impregnation, but others in which other salts had been employed, were always found to be of a different colour.

Glauber's salt, used instead of common sea-salt, left the mass red in the same manner as alum did. Nitre added, instead of sea-salt, gave the precipitate or dried salt a beautiful purple colour, which became white on the instant that water was poured upon it, and a rose-coloured tincture was drawn from it, which gave lines or letters on paper, which continued invisible as long as they were cold, but assumed a beautiful red on holding the paper to the fire; which colour they retained no longer than while the paper continued warm, disappearing afterwards in the same manner with the green colours made by the sea-salt; and if a simple solution of sea-salt be rubbed over the paper, and suffered to dry, and the paper be afterwards heated, the lines appear blue. Borax has the same effect in this preparation with the nitre. All these experiments were made with the neutral salts; but in order to try what would be the effects of alkalies in the mixture, Mr. Hellot added to three ounces of the impregnation of the ore in aquafortis, pure salt of tartar, till the ebullition ceased; but the consequence of this was no great precipitation; but merely the subsiding of a small white sediment; this mixture being evaporated nearly to a dryness, the remaining mass, so long as it was warm, appeared of a beautiful purple; but this became paler as it dried, and turned white in an instant on pouring

ing water upon it. This dissolved in water, in the manner of the others, gave lines on paper of a faint rose-colour, which appeared or disappeared in the manner of those made by the other solutions, according as the paper was hot or cold; and the wetting of the paper with a solution of sea-salt, had the same effects on this as on the others, making the lines appear blue on holding to the fire. Mem. Acad. Par. 1737. See *Colours from METALS*.

The ink may be easily made by digesting zaffre, commonly sold by druggists, in aqua regia; and thus is obtained the soluble part of zaffre, which is the calx of cobalt. This solution is then to be diluted with a little common water. In exposing the paper written with this solution to the fire, care must be taken not to heat it too much; for in this case, the writing will not again disappear by exposure to cold. This ink, says Macquer, the author of the Chemical Dictionary, may be applied to the drawing of landscapes, in which the earth and trees destitute of verdure, being drawn with common ink, give a prospect of winter; and which may be made to assume the appearance of spring, by exposure to a gentle heat, which covers the trees with leaves and the earth with grass, by rendering visible those parts of the landscapes which are drawn with this sympathetic ink; and, as the solution of regulus of cobalt or zaffre in spirit of nitre acquires a reddish colour by the application of heat, the red solution might be contrived to represent the fruits and flowers.

INK-fish, in *Ichthyology*. See CUTTLE-fish, and SEPIA.

INLAGATION, INLAGATIO, a restoring of one outlawed to the protection of the law and benefit of a subject.

The word comes from the Saxon *inlagium*, i. e. *inlagare*. Terms of Law.

INLAGH, INLAGATUS, he that is of some frankpledge, and not outlawed. It seems to be the contrary to *utlagh*.

INLAND implies any thing situate in the main land, or heart of a country, far from the sea-coasts.

Hence inland bills, in traffic, are such bills as are payable in the same land, wherein they are drawn. See BILL.

INLAND Navigation, is applied to the passage of boats, barges, and vessels on canals and navigable rivers, within a country, to distinguish it from navigation, properly so called, by means of ships on the open seas or the largest of the lakes. No country in the world can vie with the British islands at the present day, for the extent and importance of their artificial inland navigation or CANALS, under which article we have given a connected view of these, and of the navigable rivers and railways, forming altogether a system of improved communication no where to be equalled; and yet nearly the whole of them originated and was completed by individuals without the assistance of the state. See also the names of the several canals, rivers, &c. for further information.

INLAYING. See VENEERING, MOSAIC, and MARQUETRY.

INLEASED, in our *Old Writers*, signifies entangled or ensnared. It is used in the champion's oath. 2 Inst. 247. Blount.

INLETS, *Bay of*, in *Geography*, a bay on the coast of New Holland, so called by Cook, in June 1770, lying between cape Palmerston and cape Townshend.

INLI, a town of Corea; 45 miles W. of Hoang-tcheou.

INLISTING, in a *Military Sense*. See LISTING.

INMATES, such persons as are admitted, for their money, to live in the same house or cottage with another man, in different rooms, but going in at the same door; being usually supposed to be poor, and not able to maintain a whole house themselves. These are inquirable in a court-leet.

No owner or occupier of a cottage shall suffer any inmates therein, or more families than one to inhabit there, on pain of forfeiting 10s. per month to the lord of the leet.

INN, in *Geography*, a river which rises in the country of the Grisons, about 12 miles S.W. of Zuls, and runs into the Danube near Passau.—Also, a river of Austria, which runs into the Danube near Esferding.

INN, a place appointed for the entertainment and relief of travellers.

Inns are licensed and regulated by justices of the peace, who oblige the landlord to enter into recognizances for keeping good order. See ALEHOUSES.

If a person who keeps a common inn refuses to receive a traveller into his house as a guest, or to find him victuals and lodging, on his tendering him a reasonable price for them, he is liable to an action of damages, and may be indicted and fined at the king's suit. (1 Vent. 333.) By the yearly acts against mutiny and desertion, the constable, and in his default a justice of the peace, may quarter soldiers in inns, livery-stables, ale-houses, and victualling-houses. The rates of all commodities sold by innkeepers, according to our ancient laws, may be assessed; and innkeepers not selling their hay, oats, beans, &c. and all manner of victuals, at reasonable prices, without taking any thing for litter, may be fined and imprisoned, &c. by 21 Jac. I. c. 21. Where an innkeeper harbours thieves, persons of infamous character, or suffers any disorders in his house, or sets up a new inn where there is no need of one, to the hindrance of ancient well governed inns, he is indictable and fineable; and by statutes such inn may be suppressed. (1 Hawk. P. C. 225.) Action upon the case lies against any innkeeper, if a theft be committed upon his guest by a servant of the inn, or any other person not belonging to the guest; though it is otherwise where the guest is not a traveller, but one of the same town or village; for in that case the innkeeper is not chargeable; nor is the master of a private tavern answerable for a robbery committed on his guest. It is said that even though the travelling guest does not deliver his goods, &c. into the innkeeper's possession, yet if they are stolen he is chargeable. An innkeeper is not chargeable for any thing out of his inn, but only for what is within it; yet where he of his own accord puts the guest's horse to graze, and the horse is stolen, he is answerable; he not having the guest's orders for putting such horse to graze. The innkeeper may justify stopping the horse, or other things of his guest, for his reckoning; and may detain the same until it be paid. Where a person brings his horse to an inn and leaves him in the stable, the innkeeper may detain him until such time as the owner pay for his keeping; and if the horse eats out as much as he is worth, after a reasonable appraisement made, he may sell the horse and pay himself. But when a guest brings several horses to an inn, and afterwards takes them all away, excepting one, this horse so left may not be sold for payment of the debt of others; for every horse is to be sold, only to make satisfaction for what is due for his own meat.

Any person found tippling in an inn, is adjudged within the statutes against drunkenness; and innkeepers, or ale-house-keepers, permitting tippling in their houses, are liable

to the penalty of 10*s*. &c. by 1 Jac. cap. 9. 1 Car. cap. 4. 21 Jac. cap. 7.

INNS. Our colleges of municipal or common law professors and students, are called inns: the old English word for houses of noblemen, bishops, and others of extraordinary note, being of the same signification with the French word *hotel*.

INNS of Court are so called, as some think, because the students there are to serve and attend the courts of judicature; or else, because anciently these colleges received none but the sons of noblemen, and better sort of gentlemen, who were there to be qualified to serve the king in his court; as Fortescue affirms. And in his time he says, there were about two thousand students in the inns of court and chancery, all of whom were *fili nobilium*, or gentlemen born. But this custom has gradually fallen into disuse; so that in the reign of queen Elizabeth, sir Edward Coke does not reckon above a thousand students, and the number at present is very considerably less; for which judge Blackstone assigns the following reasons: 1. Because the inns of chancery being now almost totally filled by the inferior branches of the profession, are neither commodious nor proper for the resort of gentlemen of any rank or figure; so that there are very rarely any young students entered at the inns of chancery. 2. Because in the inns of court all sorts of regimen and academical superintendence, either with regard to morals or studies, are found impracticable, and therefore entirely neglected. Lastly, because persons of birth and fortune, after having finished their usual courses at the universities, have seldom leisure or resolution sufficient to enter upon a new scheme of study at a new place of instruction; wherefore few gentlemen now resort to the inns of court, but such for whom the knowledge of practice is absolutely necessary in such as are intended for the profession. Comm. book i. p. 25.

Our inns of court, justly famed for the production of men of learning in the law, are governed by masters, principals, benchers, stewards, and other officers; and have public halls for exercises, readings, &c. which the students are obliged to attend, and perform for a certain number of years, before they can be admitted to plead at the bar. These societies have not, however, any judicial authority over their members; but instead of this they have certain orders among themselves, which have by consent the force of laws. For lighter offences persons are only excommunicated, or put out of commons; for greater, they lose their chambers, and are expelled the college; and when once expelled out of one society, they are never received by any of the others. The gentlemen in these societies may be divided into benchers, outer-barristers, inner-barristers, and students.

The four principal inns of court, are the Inner Temple, and Middle Temple, heretofore the dwelling of the Knights Templars, purchased by some professors of the common law about three hundred years ago; Lincoln's Inn and Gray's Inn, anciently belonging to the earls of Lincoln and Gray. The other inns are the two Serjeants Inns.

INNS of Chancery were probably so called, because anciently inhabited by such clerks as chiefly studied the forming of writs which regularly belonged to the cursitors, who are officers of chancery.

The first of these is Thavies Inn, begun in the reign of Edward III. and since purchased by the society of Lincoln's Inn. Besides this we have New Inn, Symond's Inn, Clement's Inn; Clifford's Inn, anciently the house of lord Clifford; Staple's Inn, belonging to the merchants of the staple; Lion's Inn, anciently a common inn with the sign of the lion; Furnival's Inn, and Bernard's Inn.

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These were heretofore preparatory colleges for younger students; and many were entered here before they were admitted into the inns of court. Now they are mostly taken up by attornies, solicitors, &c.

They all belong to some of the inns of court, who formerly used to send yearly some of their barristers to read to them.

INN, or *Inner*, in the *Manege*, is applied differently, according as the horse works to the right or left upon the volts, or as he works along by a wall, a hedge, or the like. For along or by a wall, the leg that is of a side with, or next the wall, is the outer, and the other the *in* or *inner* leg. And if upon volts, the horse works to the right, the right heel is the inner, and the left the outer heel, and so of the other parts of the body, furniture, &c. The direct contrary of this will happen, if the horse works to the left.

INNATE AIR. See **AIR**.

INNATE Force. See **VIS INFLA.**

INNATE Heat. See **HEAT**.

INNATE Ideas, or *Principles*, are certain primary notes or characters, by many supposed to be stamped on the mind of man when it first receives its being, and which it brings into the world with it.

But the doctrine of innate ideas is abundantly confuted by Mr. Locke. See **IDEA**.

INNATE, in *Natural History*, particularly in that branch of it which treats of fossil remains or reliquia, is applied to such parts of the animal bodies as have been produced independently of any effort of the animal, and are either internal parts, as the bones, which often give the form to extraneous fossils, or external parts, as the scales and fins of fish, the horny covering in some of the amphibia, and the integument which incloses the whole of the body in insects, all of which are sometimes found in a fossil state, as Mr. William Martin observes in his "Outlines," p. 86. The genera of reliquia which do not depend on innate parts, but on fabricated parts of the animal parts, which are superadded to the body by some voluntary effort of the animal, are called *conchyolithus* and *erismatolithus*.

INNER BARRISTER. See **BARRISTER**.

INNER Post, is an additional piece of oak timber brought on to the fore-side of the main post upon which the transoms are let on or seated; it adds to the security of the planks, as the main post is seldom sufficient before the rabbit for that purpose, and greatly strengthens the stern or main post.

INNER See, in *Geography*, a river which rises about five miles N.W. of Gollar, and runs into the Leine, in the bishopric of Hildesheim.

INNER Sound, a strait of the North sea, between the isle of Skye, and the N.W. coast of Invernessshire, in Scotland.

INNERSHON, a small island on the west side of the gulf of Bothnia. N. lat. 61° 34'. E. long. 17° 6'.

INNICHEN, a town of Germany, in the Tyrolese situated near the Drave; anciently called "Aguntum;" 29 miles E. of Brixen. N. lat. 46° 41'. E. long. 12° 20'.

INNINGS, lands recovered from the sea, by draining and banking.

INNITPOUR, in *Geography*, a town of Bengal; 48 miles N. of Dacca.

INNO, *Ital.* a hymn, or spiritual song.

INNOCENT I. pope, in *Biography*, was a native of Albano, and was unanimously elected to the popedom by the clergy and people, on the death of Anatholius in the year 402. He obtained from the emperor new and severe laws against the Donatists, in consequence of which that sect was

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cruelly

cruelly persecuted, and those who refused to return to the bosom of the Catholic church were punished with fines, banishment, the confiscation of goods, and in some instances with death. He espoused the cause of Chrysostom, and even refused to hold communion with the eastern churches, on account of their treatment of that eminent man. He was the first who persecuted the Novatians at Rome, by depriving them of their churches, and preventing their assembling in public, for religious worship; the Pelagians came likewise under his lash; he declared them not only unworthy of Christian communion, but of human society, and even of life. He died in the year 417, after having presided over the church about fifteen years. He was a person of great address, and a lively genius, and was well acquainted with the traditions of the church. His decretals sufficiently shew his usurping and domineering spirit, and his wishes to make the Christian world submit to his insolence; they have been frequently quoted by the advocates of the see of Rome, to demonstrate how early the popes claimed, as the successors of St. Peter, an universal authority and jurisdiction. Thirty-four letters, in the first volume of the "Letters of the Popes" have been attributed to this pontiff, but by many of the ablest critics the greater part of them has been regarded as supposititious.

INNOCENT II. pope, a descendant from a noble family at Rome, ascended the papal throne in the year 1130. He had already filled some respectable offices in the church, and is said to have led a most exemplary life from his infancy, and to have been distinguished for eminent abilities and strict probity, while he was at the same time of a most humane and courteous disposition. He was promoted to the sacred college by the title of cardinal St. Angelo, and was employed by several of the popes in important negotiations at home and abroad. Upon the death of Honorius II. he was elected his successor by a part only of the conclave, the rest choosing Peter de Leon, the son of a Jew, who took the name of Anacletus II., and was acknowledged by the kings of Scotland and Sicily, while Innocent was received by the other princes of Europe. Being driven from Italy, he fled to France, where he held several councils, at one of which he thundered out a sentence of excommunication against Anacletus, and all his adherents. He crowned the emperor Lotharius with great solemnity, and for the support of his new dignity granted to him, to his daughter, and to his son-in-law, during their lives, all the estates of the countess Matilda. On the death of his rival, another pope was chosen by the same party, who took the name of Victor, but who, probably, feeling himself unequal to contend with the power of Innocent, threw himself at the feet of the pontiff, and thus put an end to the schism in the church. Innocent, having now no enemy to disturb his peace, took up his residence at Rome, and summoned a general council to meet in the Lateran in the year 1139. This was the most numerous council that had ever been held, consisting, it is reported, of a thousand bishops, besides a crowd of abbots and other ecclesiastics, who, besides other business, declared the ordinations of Anacletus null; excommunicated Roger, king of Sicily, and condemned the opinions of the famous Arnold of Brescia. Innocent, after this, was not contented with the pacific duties of his office, but actually marched in person, with his army, against the prince who seemed to set at his defiance the sentence of excommunication. Roger was too well skilled in military tactics to leave the event of the contest doubtful, he attacked the episcopal army, which he put to flight, and was so completely successful, as to take the holy pontiff prisoner, with several cardinals, and other persons of distinction. When Innocent was conducted into

the king's camp, he found, what he little expected, that he had fallen into the hands of a generous enemy; the victorious king sent some of his principal officers to beg his holiness's pardon, and to assure him he was ready to enter into an accommodation upon the terms which he had formerly offered by his deputies. Innocent readily acceded; the terms were drawn up and executed, in consequence of which the pope absolved Roger from excommunication, and solemnly invested him with the kingdom of Sicily, the dukedom of Apulia, and the principality of Capua; while, on the other hand, the king acknowledged Innocent for lawful pope, and engaged to assist him whenever his aid should be required. Upon the recovery of his liberty Innocent returned to Rome, but the remainder of his life was spent in much disquiet. The last two years of his life were wholly occupied in reducing several cities which attempted to shake off the yoke of the apostolic see, and to recover their ancient liberty. The Romans also refused to obey him as their prince, restored their senate, and created their own magistrates. In the midst of these calamities the pope fell sick, and died in 1143, after a pontificate of nearly fourteen years. In private life he was most highly esteemed on account of the suavity of his manners, but from the several revolts which took place while he was head of the church, it has been suspected that his administration of government was not conducted with prudence and wisdom, and that his zeal for exalting the papal pretensions was not behind that of any of his predecessors. Forty-three of his letters are inserted in the tenth volume of the Collect. Concil.

INNOCENT III. pope, originally called Lotharius, was a descendant from the illustrious house of the counts of Segni, and born at Anagni about the year 1161. After pursuing his studies at Rome, he went to the university of Paris, where he was admitted to the degree of doctor. From this period he was advanced very rapidly in the church; was ordained sub-deacon by Gregory VIII., and preferred to the dignity of cardinal-deacon by Clement III., under the title of cardinal St. Sergius, and St. Bacchus. On the death of pope Celestine III. in the year 1198, Lotharius was elected his successor, being then only in his thirty-seventh year. Being at this period only in deacon's orders, he was first ordained priest, in order to his being able to undertake the high office of pope, when he assumed the name of Innocent III. From the moment of his exaltation, he seems to have set before him, as objects for his imitation, the character and conduct of pope Gregory VII., and with equal intrepidity and address, pursued his plans of ambition, till he arrived at a height of despotism, which the world beheld with wonder and astonishment, but to which the states of Europe submitted with a silence that was highly disgraceful to them. "Under this young and ambitious priest," says Gibbon, "the successors of St. Peter attained the full meridian of their greatness; and in a reign of eighteen years, he exercised a despotic command over the emperors and kings whom he raised and deposed; over the nations, whom an interdict of months or years deprived, for the offence of their rulers, of the exercise of Christian worship. In the council of the Lateran he acted as the ecclesiastical, almost as the temporal, sovereign of the East and West. It was at the feet of this legate that John of England surrendered his crown; and Innocent may boast of the two most signal triumphs over sense and humanity, the establishment of transubstantiation, and the origin of the inquisition. At his voice, two crusades, the fourth and the fifth, were undertaken; but except a king of Hungary, the princes of the second order were at the head of the pilgrims; the forces were inadequate to the design; nor did the effects correspond with the hopes and

and wishes of the pope and the people." Innocent did not confine his efforts to the Holy Land, he promoted a crusade against the Albigenes. He first attempted to convert them by his missionaries, one of whom was murdered, which was the signal for the display of all his wrath; he did not even deign to institute an inquiry, but ordered the whole race to be pursued with fire and sword, and to be treated with more severity than the Saracens themselves. Immense numbers of lives were sacrificed in his holy war, and barbarities practised, before unheard of; but the perpetrators of them were applauded and rewarded by the cruel pontiff, and the infernal spirit by which they had been actuated was impiously called zeal in supporting the cause of God and of the church. In 1215, the fourth general Lateran council was held at Rome, which was so managed by the all-controlling power of the pontiff, that instead of exercising the functions of a deliberative body, it was made use of only as an instrument to register canons and decrees which Innocent had drawn up, and which he permitted to be read for their approbation. In this council a sentence, which had been pronounced some time before, suspending Stephen Langton, archbishop of Canterbury, was confirmed. The pope, likewise, thundered out a sentence of excommunication against the barons, which they treated with merited contempt, and bravely persisted in defending those privileges, the characters of which they had lately compelled their monarch to sign. In the year 1216, Innocent undertook a journey to Pisa; but on his arrival at Perugia he was attacked with a violent disorder, which put an end to his life in a few days. According to Mr. Berington, "Innocent was learned, magnificent, perseverant, wise. In the knowledge of laws and politics he had no equal: he possessed the art of government, and was obeyed more from fear than love. Ambition was his ruling passion, to gratify which, he overstepped the bounds of decency and justice, playing as wantonly with the solemn censures of the church as if they had been instituted for the common purposes of wayward caprice or resentful vengeance. To look into him for the amiable virtues of life, or for those which should form the pastoral character, would be loss of time. The prerogative of the holy see, built up by adulation and misjudging zeal, filled his mind; its aggrandizement he sought sometimes, perhaps, from motives which the cool reasoner may excuse; and the meteor of universal empire gleaming on his senses, did not permit the operation of a dispassionate and unbiassed judgment. No tears were shed when Innocent fell, but those which Religion wept, too justly pained by the inordinate exertions and worldly views of her first minister." Innocent was the author of a variety of works, which are enumerated by Dupin, but the most valuable are his "Epistles," which threw considerable light on the ecclesiastical history of his time. His works have been collected in two volumes folio; the best edition is that published at Paris in 1682.

INNOCENT IV., pope, was a native of Genoa, and being distinguished for his learning and attainments, he was in early life made canon of Parma, from which he was promoted to the chancellorship of the Roman church. In 1227 he was raised to the purple by Gregory IX., and in 1243 he was elevated to the papal throne, when he took the name of Innocent IV. Previously to this he was on terms of strict intimacy with the emperor Frederic II., who had been engaged in a contest with the court of Rome, and that prince no sooner received the news of his exaltation, than he sent a splendid embassy to congratulate him upon his election, and to assure him that nothing should be wanting to re-establish harmony between the church and the empire. The pope, however, began to assume a dignity inconsistent with friend-

ship, and he plainly declared that he was resolved to maintain the highest pretensions of the apostolical see. Legates were dispatched to accommodate all differences, but it was of no avail, and hopes of reconciliation being at an end, Frederic prepared to reduce the pope to reason by the terror of his arms. Innocent, unable to resist the power of the emperor, fled for protection to his native city, where he was received with every mark of distinction. Here he assembled a council, consisting of about 140 prelates, some princes, and the ambassadors of most of the crowned heads in Europe; he laid before this august assembly the motives which induced him to call them together, describing the emperor as a tyrant, a persecutor of the church, and as guilty of heresy, sacrilege, and other grievous crimes. The council gave credit to the pontiff, and sanctioned the sentence of excommunication pronounced against him. This led to a most destructive war, which was carried on in Germany and Italy till the death of the emperor Frederic in 1250, who was succeeded by his eldest son Conrad, who took up his father's cause with so much zeal and intrepidity, as rendered Innocent fully sensible of his inability to withstand that prince with his own forces only. He accordingly made many unsuccessful attempts for obtaining assistance, and his army was defeated, which so affected the pontiff, that he fell sick and died in the month of December 1254, after he had presided over the church nearly twelve years. He had high notions respecting the power and authority of the papal see: he possessed considerable learning; was well acquainted with the divinity of the times, and was regarded as the best civilian of his age. He was author of a work entitled "*Apparatus, Libris quinque distinctus, in totidem Libros Decretalium*," first printed at Venice in 1570; and of several other pieces, besides twenty letters, which are inserted in the eleventh volume of the Collect. Concil. He was not only learned, but a great encourager of learning, and is said to have been the first who gave red hats to the cardinals.

INNOCENT V., pope, was born at a town on the Isère, in Burgundy. When very young he entered the Dominican order of preaching friars, and pursued his studies in divinity with so much success, that he was appointed to fill the theological chair in the university of that city, and was considered as one of the most learned divines of the age. He obtained considerable preferment in the church, and about 1271 was nominated by pope Gregory X. archbishop of Lyons, and soon afterwards was promoted to the sacred college by the title of cardinal bishop of Ostia. On the death of Gregory he was unanimously chosen his successor in the papal dignity, and took the name of Innocent V. Besides reconciling those states of Italy which were carrying on the most bloody wars against each other under the opposite denominations of Guelphs and Gibellines, and bringing about a peace between the republics of Lucca and Pisa, he projected the mission of a splendid legation into the East, to obtain from the emperor, Michael Palæologus, the confirmation of the articles of union, but he died before he could carry his design into execution, after a short pontificate of about five months. He wrote "Commentaries" upon the Pentateuch, the Canticles, and the Gospels: "Notes on the Epistles of St. Paul," and other pieces, which have been published since his death.

INNOCENT VI., pope, formerly called Stephen Aubert, was brought up to the study and practice of the law, and in 1335 he was professor of the civil-law at Toulouse, and chief judge of that city. In two years after we find him bishop of Noyon, and in 1340 he was translated to the see of Clermont. In 1342 he was raised by pope Clement VI. to the dignity of cardinal bishop of Ostia, and at the same time appointed grand penitentiary of the Romish church. In 1352

INNOCENT.

he was unanimously chosen pope, and took the name of Innocent VI. He made it his business to correct abuses, and also abolished the heavy impositions laid upon the clergy, when preferred to any new benefice or dignity. He retrenched all the unnecessary expences of the papal court, contenting himself even with a small number of attendants: he obliged the cardinals to follow his example, urging them to bestow the superabundance of their wealth in relieving the necessities of the poor. Innocent maintained the decrees of his predecessors against those Minorite friars who assumed the title of "Spiritual Brethren," and who contended against the right of the clergy possessing any property. Two of this description were arrested at Montpellier in the year 1354; the pope attempted to convert them from the error of their ways, but finding them obstinate, he gave them up to the inquisitors to be burnt alive. In the following year he sent a legate a latere to Rome to crown Charles, king of Germany, and his queen Anne with the imperial crown, but not before that prince had subscribed to the most humiliating conditions. After this, nothing occurs during the remainder of Innocent's pontificate which requires to be noticed. He died at Avignon in 1362, after he had filled the papal chair nearly ten years. He has been highly commended for his probity and the sanctity of his life: he was generous to the wants of the poor: an enemy to vice, the patron and protector of virtue in every condition of life. He left behind him many epistles, some of which have been printed, and others are preserved in the Vatican.

INNOCENT VII., pope, was born at Salmona, in Abruzzo, about the year 1339, obtained a high reputation for his knowledge of the civil and canon law, was made clerk of the apostolic chamber by pope Urban VI., and was afterwards employed to collect the revenues of the apostolic see of England. As a reward for his services in those situations he obtained considerable church preferment, and was at length raised to the sacred college under the title of cardinal presbyter of Santa Croce. On the death of Boniface IX. he was chosen to the popedom, and took the name of Innocent VII. Scarcely had he been consecrated, when a dreadful tumult broke out in Rome between the Ghibelines and the Guelphs: this led to other disturbances, which lasted during the pontificate of Innocent, who died in about two years after his elevation. He is represented as of a mild and pacific disposition; of a generous and beneficent temper; an enemy to all pomp and show; free from pride and ambition, and of great address in state affairs. He is much blamed for having been the occasion of elevating unworthy persons to the highest posts of dignity and trust. He is author of a discourse "On Church Union," and some "Letters."

INNOCENT VIII., pope, was born at Genoa in the year 1432: at an early age he was sent to the court of Naples, where he lived several years during the reigns of Alphonso and his son Ferdinand, and received substantial marks of favour from both princes. After this he removed to Rome, and obtained considerable church preferment, till at length he was raised to the purple by the title of cardinal of St. Balbina in the year 1473. Upon the death of Sixtus IV. in 1484, he was elected his successor, and took the name of Innocent VIII., having been previously known by that of John Baptist Cibo. As soon as he was seated in his government, he attempted to procure another crusade, but without success. His efforts, however, contributed to bring much wealth into the apostolic treasury, part of which the pope appropriated to his own use; and the rest he expended on the repair of ancient works of art, or in support of a war in which he soon became involved with Ferdinand, king of Naples. Innocent spent the concluding years of his ponti-

ficate in endeavouring to maintain order and good government in the church, and in cultivating the arts of peace. He cleared the country of robbers and assassins, with which it was at that time much infested; adopted measures for the regular supply of Rome with provisions, and adorned it with many magnificent buildings. He died in the year 1492, aged 60, after he had filled the papal throne nearly eight years. He was possessed of a very moderate share of learning and talents, but secured the attachment of all ranks by the sweetness of his temper and the gentleness of his manner. His character, in a moral point of view, will not bear examination: he unblushingly acknowledged himself the father of a numerous progeny of natural children, and is said to have been the first of the popes who introduced that new and extraordinary proceeding of owning publicly his spurious issue, heaping upon them riches without measure. He left behind him some letters, and one to Henry VII., king of England, against citing the clerical orders before secular tribunals.

INNOCENT IX., pope, known originally under the name of John-Anthony-Pacchinetti, was born at Bologna in the year 1519, where he received his education, and was admitted to the degree of doctor in 1544. He now became a domestic in the family of cardinal Farnese, who sent him in the capacity of vicar to Avignon, and again to Parma. In 1566, he was sent by Pius V. as nuncio to Venice, where he had a principal concern in establishing the confederacy between the pope, the king of Spain, and the republic against the Turks. After this he was created patriarch of Jerusalem, president of the inquisition, and cardinal. In 1591, he was unanimously elected to the popedom, when he took the name of Innocent IX. He immediately projected grand plans of improvement, of an ecclesiastical and economical nature, none of which did he live to execute. He died in the second month of his pontificate, at the age of seventy-two.

INNOCENT X., pope, was born at Rome about the year 1575, where he was educated and brought up to the profession of the civil law, of which he was admitted doctor when he was only in his twentieth year. He obtained many instances of preferment in the church, and, in 1627, a cardinal's hat was presented to him by pope Urban VIII. He was next made prefect of the ecclesiastical immunities, supreme judge of the inquisition, and protector of the kingdom of Poland. On the death of Urban he was elected pope; he had already carried on an illicit commerce with his brother's widow, Donna Olympia Maldachini, to whom he now abandoned himself, the administration of his temporal affairs, and the government of the church. All benefices, all employments, whether ecclesiastical, civil, or military, were disposed of by her to the highest bidders, without any regard to friendship or merit, or to the character of the purchasers. She induced the pope to forget all sense of right and wrong when it interfered with her wishes. In 1645, upon the application of the Dominicans, who were associated with the Jesuits in the mission to China, Innocent condemned the indulgence which the Jesuits had shewn to the Chinese superstitions. The most remarkable transaction of his pontificate, was his condemning, by a bull, in the year 1653, the five propositions selected by the Jesuits from Janfenius's "Augustinus." He died in 1655, about the age of eighty-one, having filled the papal throne little more than ten years.

INNOCENT XI. was born at Como, in the duchy of Milan, in the year 1611. He was the son of a rich banker, and his first profession was that of a soldier, in which he distinguished himself by his gallantry. Quitting the military character he embraced the ecclesiastical profession, and

went to study at Naples, where he was admitted to the degree of doctor. Having filled, with high reputation, several offices in the church, he was raised to the purple in 1645, and, in 1678, he was elected to the popedom. He began his high career with abolishing abuses, and suppressing many gross superstitions then prevailing in the church of Rome. He likewise attempted, by wise institutions and judicious regulations, to reform the manners of the clergy, and to stem the torrent of licentious morals among the laity. In 1677, he suppressed "the right of asylum," enjoyed by foreign ministers at Rome, extending much farther than their palaces, the immunities of which it was not designed to violate. Most of the ambassadors from foreign courts readily acquiesced, but the minister from the court of France refused to submit to it, and the pope, unwilling to enter into a contest with Lewis XIV., allowed his ambassador to enjoy his ancient privileges. He had now a contest with the French king, about the right of disposing of benefices and church lands claimed by that monarch, and confirmed to him by an assembly of the clergy, which nearly terminated in a separation of the Gallican church from the Roman communion. It was on this occasion that Lewis summoned the famous assembly of bishops, which met at Paris in the year 1682, and drew up the four celebrated propositions declaring the power of the pope to be merely spiritual, and inferior to that of a general council, and maintaining the inviolability of the rules, institutions, and observances of the Gallican church. Innocent died in 1689, having presided over the Roman see twelve years and a half. He was virtuous and pious, but without pretensions to learning. His zeal for the reformation of abuses, the improvement of morals, and the restoration of church discipline, has given him a rank among the best of the popes.

INNOCENT XII., pope, originally named Anthony Pignatelli, was descended from an illustrious family at Naples, and born there in the year 1615, and succeeded to the popedom in 1691, as successor to Alexander the VIIIth. In imitation of the example of pope Innocent XI. he applied himself to the reformation of the church and court of Rome. He was unwearied in his endeavours to reform the corrupt manners of the clergy, which were not wholly unsuccessful, though he found that the entire accomplishment of the Herculean task was a consummation, which all his prudence and resolution were unable to effect. He was anxiously devoted to the interests of the poor, and the wealth which many of his predecessors had been accustomed to accumulate, or to bestow on worthless relatives, he devoted to the public benefit, employing it in the erection of hospitals, and other useful institutions, and particularly in the improvement of the ports of Anzio and Nettuno. Innocent died in the year 1700, at the advanced age of eighty-five, after presiding over the church about nine years. He had rendered himself universally respected by his talents, and beloved on account of his many virtues.

INNOCENT XIII., pope, formerly named Michael-Angelo Conti, son of Charles Conti, duke of Poli, was born at Rome in the year 1655. He rose successively to the highest offices in the church, till at length he was elected successor to Clement XI., in the papal dignity, in the year 1721. He died in 1724, leaving behind him a character for great wisdom, virtue, and learning. When a cardinal he distinguished himself above most of the members of the sacred college; but the infirmities to which he had been some years subject, prevented him from distinguishing his pontificate by any actions which are worthy of being recorded. As authorities for the foregoing articles, see Bower's Hist. of the Popes; Moreri, Gibbon, &c.

INNOCENTS DAY, the name of a feast celebrated on the twenty-eighth day of December, in commemoration of the infants murdered by Herod.

Heretofore it was the custom to have dances in the churches on this day, wherein were persons, who represented bishops, by way of derision, as some suggest, of the episcopal dignity; though others, with more probability, suppose it done in honour of the innocence of childhood. See *EPISCOPUS puerorum*.

By a canon of the council of Cognac, held in 1260, these were expressly forbidden; but they were not wholly suppressed, at least in France, before the year 1444, when the doctors of the Sorbonne addressed a spirited letter on this subject to all the bishops of the kingdom.

INNOMINATA ARTERIA, in *Anatomy*, the first large trunk sent off from the arch of the aorta. See *ARTERY*.

INNOMINATA glandula, the lachrymal gland. See *EYE*.

INNOMINATI, *Gli Innominati*, *Anonymi*. persons who have no names, a title by which the academists of Parma distinguish themselves.

Most cities in Italy have an academy, and each has its proper name. Thus those at Parma entitle themselves *Gli innominati*, as if it was their character to have no name at all.

INNOMINATUM, *Os*, in *Anatomy*, the large bone composing the chief part of the sides of the pelvis, and receiving the articulation of the lower extremity. See *EXTREMITIES*.

INNOVATION, in *Law*. See *NOVATION*.

INNUENDO, of *innuo*, *I nod*, or *beckon*, is a word frequently used in writs, declarations, and pleadings, to ascertain a person or thing which was named, but left doubtful, before: as, he (*innuendo* the plaintiff) did so and so; mention being before made of another person. In common observation or writing, an *innuendo* denotes an oblique hint, or distant reference; in contradistinction to a direct and positive charge.

INNY, in *Geography*, the name of two rivers in Ireland; one which rises in the county of Westmeath, and having passed through Loughs Derveragh and Iron, forms a boundary between this county and Longford, for several miles, after which it crosses the southern part of the latter, and flows into Lough Ree, an expanse of the Shannon; the other is a mountain stream in the barony of Iveragh, Kerry, which empties itself into Ballin Skelig's bay.

INOCARPUS, in *Botany*, from *is, nos*, a fibre, or nerve, and *καρπος*, a fruit, because the drupa of this genus is composed of fibres or nerves. Schreb. 297. Forster. Gen. 33. Linn. Suppl. 35. Thunb. Nov. Gen. 45. Willd. Sp. Pl. v. 2. 624. Mart. Mill. Dict. v. 2. Juss. 152. Lamarck Dict. v. 3. 253. Illustr. t. 362. Class and order, *Decandria Monogynia*. Nat. Ord. *Dumose*, Linn. *Sapote*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf (campanulate, according to Thunberg) in two, roundish, nearly equal segments. *Cr* of one petal, tubular; tube cylindrical, longer than the calyx; limb longer than the tube, divided into five, linear, acute, undelated, often reflexed segments. *Stam.* Filaments ten, very short, inserted into the tube; the lower ones alternate; anthers ovate, twin, erect. *Pist.* Germen oblong, hairy, superior; style none; stigma a hollow point. *Peric.* Drupa ovate, incurved, compressed, large, single-seeded. *Seed.* A nut composed of woody fibres; kernel oval, compressed.

Eff. Ch. Calyx bifid. Corolla funnel-shaped. Stamens in a double row. Drupa single-seeded.

1. *I. edulis*. Willd. Sp. Pl. v. 2. 624. (Cujanus; Rumph. Amboin. v. 1. 170. t. 65.) A native of the Society, Friendly, and

and New Hebrides Islands, in the South seas, and also of Amboina. Forster describes this as a lofty tree, having a trunk as thick as a man's body, with a brown chinky bark. Branches woody, spreading, variously divided. Leaves ovate-oblong, scarcely cordate, netted with abundance of veins. Flowers dusky white, scarcely half an inch in length. From Cook's last voyage we learn, that the nuts of *Inocarpus* are called *E-iss*. The kernel of these, which is kidney-shaped, and about an inch in diameter, is eaten roasted by the natives. It is sweetish, but less pleasant than the chestnut, harder, and not so farinaceous. The bark is astringent, and used in the dysentery. In New Guinea, they smear their arrows with the expressed resinous juice.

INOCULATING, in *Gardening*, the art or practice of inserting the buds of trees of the same kind into their stocks or other parts. It is a sort of grafting which is often had recourse to in the summer season for raising different kinds of trees and plants, as it frequently succeeds better than that of the common method. It is usually executed in the manner described below. A sharp knife, with a flat haft for the purpose, and proper cuttings of the trees designed to be propagated being provided, a choice should be made of a smooth part of the stock which is to be inoculated; five or six inches from the ground, where intended to be dwarf, but when for a standard at the height of five and a half or six feet; and a horizontal cut made across the rind of the stock, as well as a slit, about two inches in length, downwards from the middle of that cut, taking care not to go deeper than the thickness of the bark, lest the stock be wounded; then having the cutting in readiness, the leaf should be cut off from the bud, leaving the foot-stalk remaining, but taking off the bud lengthways somewhat longer than the slit in the stock, with part of the wood adhering to it; which being done, slip the wood from the bark with the knife by means of a sudden jerk, observing whether the eye of the bud be left or not, as such buds as lose their eyes in stripping are quite useless: as soon as this has been done, the bark should be gently raised on each side of the slit in the stock with the handle of the knife, and the bud inserted into it, being careful to place it smooth between the rind and the woody part of the stock, cutting off that part of the rind of the bud which may happen to be too long for the slit: having thus exactly fitted the bud to the stock, they should be tied closely round with wetted strong bafs, taking care not to pass any ligature round the eye of the bud, which must always be left open and at liberty. In the course of three weeks, or a month, the buds will require to be loosened of the bandage, and which, if not executed in time, will be highly injurious to them; but they should not be wholly divested of the binding, it being proper to tie them again slightly, by which the bark of the stock will be prevented from becoming open, which sometimes takes place, and the bud is thereby greatly injured, if not wholly destroyed.

There is nothing further required until the following March, when the stock should be cut off about three inches above the place of inoculation, sloping it the contrary way to the bud. This length of stock left is beneficial in fastening the shoot which springs from the bud, and which might otherwise be blown out by strong winds: in the autumn following, however, it should be cut away quite close just above the bud, that the wounded part may the more readily become barked over.

It may be noticed, that the most proper season for this sort of work is, from the middle of June until the middle of August, according to the forwardness of the season, and the particular sorts of trees to be increased; but it may be easily known by trying whether the buds will come off well

from the wood or not. The most general rule is, when the buds are found to be formed at the extremity of the same year's shoots, which is a sign of their having finished their vernal growth. The first sort commonly inoculated is the apricot, and the last that of the orange-tree, which should never be done until the middle of August.

In doing this sort of work, choice should be made of cloudy weather, as when done in the middle of the day, in very hot weather, the shoots perspire so fast as to leave the buds destitute of moisture; nor should the cuttings be taken off from the trees long before they are used; but if fetched from some distance the leaves should be cut off, but all the foot-stalks left, and then wrapped up in wet moss, and put in a tin-box to exclude the action of the external air upon them. But the practice of throwing cuttings into water is highly improper, as it saturates the buds so with moisture, that they have no attractive force left to imbibe the sap of the stock, for want of which they very often miscarry, and disappoint the operator.

It has been remarked by Mr. Forsyth, that when the pear-trees which are grafted in the spring have not taken, he would advise the cutting them off a little below the graft at a joint or bud. The tree then throws out a great number of healthy shoots; all of which should be rubbed off, except so many as are sufficient to fill the wall; nailing those up to prevent the wind from breaking them. About the latter end of July the shoots will be fit to inoculate, which should then be done, leaving a little of the wood on the inside of the bud when inserted into the stock, and rubbing in some of the composition, tying on the bafs at the same time.

Having grafted some summer bonchrétions with the bergamot de Pasque (or Easter bergamot) and pear d'Auch in the spring, most of which failed, he cut them off below the grafts, and in July following they had produced shoots from five to six feet long, which he inoculated in the latter end of that month with the before-mentioned sorts, which all took. About the beginning of September he ordered the bafes to be slackened; which being left too loose, the barks began to separate. He then made them be tightened, letting them remain till the following spring. About the beginning of April, when he saw the buds begin to shoot, he cut the shoots near to the buds; but finding many where the bark had not united, and some of the eyes apparently dead, he took a sharp penknife and cut out all the decayed bark, rubbing in some of the composition in a liquid state, till the hollow parts were filled up; he then smoothed it off with the finger even with the bark of the stock. He also rubbed some of the composition over those eyes that were in the worst state, being quite black, but with very little hope of recovery. "To his great astonishment, many of those which seemed perfectly dead recovered, and by the middle of July had shoots from five to six feet long (many of the shoots which took well having fruit-buds formed for next year), and covered a space of wall larger than a young tree would have done in eight years; all the cavities where he cut out the dead bark and applied the composition were, in the course of the summer, filled up with sound wood, and the bark between the stocks and grafts perfectly united.

"Three years ago he inoculated some brown beurrés and crasanes with pear d'Auch, one of which now covers a wall sixteen feet high and fifteen long, and has more fruit on it this year than a maiden tree would have produced twenty years after planting." But he "never recommends inoculating or grafting of old trees, except when bad sorts, or more of any sort is wanted for a supply; in that case he would recommend to inoculate or graft with pear d'Auch, colmars,

colmars, and winter bonechrétiens, which keep much longer than beurrés, crânes, &c."

But for standards that have been grafted in the spring and have missed, he advises that they should be cut below the graft, as, when so treated, they throw out a great number of shoots, which should by no means be too soon thinned, as in that case they will be liable to be broken by the wind. The weakest shoots may be begun to be taken off about the latter end of May or beginning of June. About the middle of the latter month they will have acquired considerable strength, then thin them, leaving as many strong regular shoots, and of those nearest the top of the stem, as will form a handsome head. If the stem be very strong, it will be necessary, perhaps, to leave more than are intended to be inoculated on purpose to receive the sap, which will flow in great abundance from a large trunk, and without this precaution be apt to burst the shoots. He has often seen shoots as large as his arm burst by a superabundance of sap. When that is likely to happen, the best thing is to scarify the shoots and rub a little of the composition into the wound. See **BUD, BUDDING, and GRAFTING.**

INOCULATION, among *Gardeners*, signifies an operation in the management of some sorts of fruit trees, which is frequently denominated *budding*. See **BUDDING**, and the preceding article.

INOCULATION, in a *surgical and medical* sense, denotes the practice of designedly communicating from one person to another certain diseases, which is generally done by introducing some of the infectious matter into a small wound, or puncture, made with the point of a lancet. The common purpose of such operation is to diminish the severity and peril of a distemper, which, taken in a casual way, proves exceedingly destructive, and the hazard of catching which, at some period of life or another, is very considerable. A chief object of the plan is also, in general, to render the patient incapable of being again affected by the dreaded contagion. Hence inoculation is seldom performed, but for a disease with which the human constitution can only be affected once, as the small-pox and cow-pox. The latter, which is so mild as scarcely to deserve the name of a disease, being only communicable by contact, and existing originally no where except upon the teats and udders of cows, would never perhaps have troubled any other persons than a few milkers, had it not been for the discovery of the important fact, that persons who had undergone the complaint were made completely unsusceptible of the small-pox contagion. The cow-pox inoculation has now, therefore, been very generally substituted for that with variolous matter, and the beneficial consequences of this change are so truly important that the Jennerian discovery will ever be regarded as a most memorable event, not only in the annals of medicine and surgery, but in the history of the world. See **COW-POX and VACCINATION.**

Although it is our intention to devote this article to the history of the small-pox inoculation, we may here remark, that the measles have been propagated by inoculation. Dr. Home, of Edinburgh, was the first who actually made the experiment. Not being able to collect either matter, or a sufficient quantity of broken cuticle at the time of desquamation, to produce the disease, he drew blood from a superficial cutaneous vein, where the eruption was thickest. Cotton was then dipped in this blood, and applied to a wound made in each arm of the person about to be inoculated. In this manner Dr. Home inoculated twelve persons. The eruptive fever generally began six days after inoculation; the symptoms were less severe; the cough was milder, or entirely absent; and the inflammation of the eyes was trifling.

Notwithstanding Dr. Home's success, inoculation for the measles is seldom or never practised, others, who have made the experiment, not having given reports equally favourable.

Inoculation for the plague has likewise been tried, in order to ascertain whether that distemper might not be rendered less fatal and less prevalent in particular parts of the world. In Egypt, Dr. Whyte inoculated himself with matter taken from the buboes of an infected person. The attempt failed twice; and the third proved fatal in three days after the commencement of the symptoms. See *Dr. Wilson's Hist. of the Expedition to Egypt.*

In the present state of our information, inoculation for the plague appears unjustifiable. It was ascertained in Egypt, that many of the convalescents took the plague a second time; nor, in all probability, does inoculation render this distemper milder. Indeed, what M. Sonnini observes, seems to lead to a contrary conclusion; for he mentions, that a Russian surgeon, who was a prisoner at Constantinople, with a number of his countrymen, took it into his head to inoculate these unfortunate men with the plague, under the idea of rendering the contagion less destructive; but the result was, that two hundred lost their lives, as well as the surgeon, who had also inoculated himself. See *Sonnini's Travels into Greece and Turkey*, p. 497.

The idea of intentionally imparting any kind of disease to the human body would appear, to persons unacquainted with the reason of the thing, equally extraordinary and cruel. But the design and utility of the inoculation for the small-pox are now so fully known among all classes of society, as scarcely to need explanation. When it is remembered, that the small-pox contagion has, at various periods, nearly depopulated extensive kingdoms, and occasioned greater devastation than the most destructive wars, any measure, calculated to render milder so terrible a disease, must be looked upon as a discovery of the very highest importance. It has been estimated, that, upon an average, before the introduction of inoculation, one out of every six persons affected with the natural small-pox, or sometimes even a half, perished; but that the proportion of deaths, among such as have been inoculated in the most improved manner, does not amount to more than one in several hundreds. Besides this circumstance, we have to mention, that before inoculation became common, the small-pox frequently committed ravages like the plague, and the fury of the distemper was always dreadful whenever the contagion made its first visit to a country. If, then, we are to hail the small-pox inoculation as a general and momentous benefit to society, on the principles just now specified, with what joy and admiration must we behold the discovery of a complete security against the small-pox infection, in the new and perfectly safe kind of inoculation with vaccine lymph. The small-pox inoculation materially alleviated the calamities arising from that contagion, by making the disease milder, and lessening its mortality. But, still, the distemper was not unfrequently seen in a severe form; at least one out of every three or four hundred inoculated died; and the countenances of those who survived were often miserably pitted and disfigured. On the other hand, the vaccine inoculation hardly ever produces any serious indisposition, and being followed by no eruption, cannot deform the face. Its safety and efficacy are daily receiving more and more confirmation from all quarters of the world, and we have no doubt that, after prejudices have had time to subside, the small-pox inoculation will be universally superfed.

The original introduction of inoculation, however, will always constitute a most memorable event in history, and is

a subject too interesting to be omitted in our work. After a few observations on the commencement of the small-pox, we shall therefore endeavour to give some account of the rise and progress of the practice.

Origin of the Small-pox.—The small-pox, like the measles, and several other diseases, is produced by a matter *sui generis*, or, in other words, by a specific contagion, and it has originated from causes so perfectly incomprehensible, as to set at defiance all rational conjecture. From the silence of the ancient Greeks and Romans respecting a disease so very fatal, and of such peculiarity, as the small-pox, it is reasonable to conclude, that its date is subsequent to their times, and, consequently, that the world existed several thousand years before it was visited by this dreadful pestilence. Rhazes, an Arabian physician, who practised at Bagdad in the beginning of the tenth century, is one of the oldest writers on the small-pox, whose works are still extant. On this subject, however, he quotes several of his predecessors, the most ancient of whom is Ahron, who was a priest and physician at Alexandria, when that city was besieged by the Saracens. Ahron's book has, therefore, been deemed the first in which any notice is taken of the small-pox. The introduction of the disease, at that time, into Egypt, might have been by the armies of Amrou, which, in the kaliphate of Omar, poured in thither from Arabia.

The celebrated Dr. Friend conceived, that the Arabians might originally have derived the contagion from some of the more distant regions of the East, and Père D'Entrecolles, a missionary jesuit at Pekin, informs us, that, upon looking over some Chinese books, he found the small-pox mentioned in them as a disease known in very ancient times. See "*Lettres edifiantes et curieuses*," tom. 21. p. 33. ed. 1781.

Mr. Holwell, a Bengal surgeon, has likewise endeavoured to confirm the accuracy of Dr. Friend's opinion, observing, that, "at the period in which the Aughtorrah Bhade scriptures of the Gentoos were promulged, (according to the Bramins 3366 years ago,) this disease must then have been of some standing, as those scriptures institute a form of divine worship, with poojahs, or offerings, to a female divinity, styled by the common people Goote ka Tagooran, the Goddess of Spots, whose aid and patronage are invoked during the continuance of the small-pox season; also in the measles, and every cutaneous eruption that is in the smallest degree epidemical. See "*An Account of the Manner of inoculating the Small-pox in the East Indies*," p. 7.

On the other hand, Dr. Woodville is unwilling to admit, that the supposed antiquity of the small-pox in India is at all proved by what D'Entrecolles and Mr. Holwell have observed. He remarks, that the former has adduced no direct fact, shewing, that the disease was really described by the ancient Chinese physicians; while Mr. Holwell's reasons must be inconclusive, not only as founded on the verity of the Hindoo chronology; but because the Goddess of Spots was not supposed to preside over any particular eruptive disorder, but over all cutaneous affections that were epidemical. Besides, as Dr. Woodville justly notices, had the small-pox existed in India more than 3366 years, it could not fail to have been transported in early times both to the Greeks and Romans, by the constant intercourse, which they indirectly maintained with the Indian nations.

Dr. John James Reiske mentions, that, in an old Arabic MS. preserved in the public library at Leyden, he read, that, in the year of the birth of Mahomet, the measles and small-pox made their first appearance in Arabia. Disp. inaug. Lugd. Bat. 1746. Now it appears also from some Arabian

annals, procured by that adventurous traveller, Mr. Bruce, that the era of the first appearance of the small-pox in Arabia attaches to that of the siege of Mecca, and that the Abyssinian army, commanded by Abrahah, was the first victim of its fury. Mr. Gibbon states, that the siege of Mecca happened only two months before the birth of Mahomet; a fact, which Dr. Woodville points out as deserving very particular notice; for if the year of the birth of Mahomet be ascertained to be also that of the siege of Mecca, the Arabian MS. cited by Dr. Reiske, and that written by Hameefy, the Arabian author mentioned by Mr. Bruce, perfectly coincide. According to Gibbon, Mahomet was born A.D. 569; which, on the above independent authorities, is to be considered as the period when the small-pox first made its appearance in Arabia.

From this era, to that of the conquest of Alexandria in 640, no traces of the existence of the small-pox are to be discovered; but the disease certainly spread into that city at the time it was invested by the Saracens; and, as Dr. Woodville states, it may therefore be supposed to have been brought into Egypt by the Mahometan army, which, six years before, had invaded Persia and Syria, where this destructive pestilence probably had already made a considerable progress.

After this period, to the revival of literature in the 15th century, succeeded that general state of ignorance and barbarism, during which the present subject, in common with many others, is so obscured in the darkness of the times as to elude the most diligent research.

It is manifest from the works of Rhazes, that many of the Arabian physicians had written on the small-pox before the 10th century; and notwithstanding the Saracen history is silent on the ravages which must have accompanied the general diffusion of the small-pox during the empire of the caliphs, the progress and prevalence of the distemper are to be inferred from collateral evidence. Thus, the caliph Yezid, who died in 683, is mentioned as being pitted with the small-pox; and the caliph Abul-Abbas Alsfah actually died, in 753, of this disease.

The time when the small-pox contagion first spread into Great Britain is involved in doubt. Most writers suppose that the distemper was imported into Europe by the crusaders, upon their return from the Holy Land in the 13th century. The improbability of this statement is insisted upon by Dr. Woodville, who adverts to the known activity of variolous matter, the long time it retains its infectious quality, and the unlikely circumstance of the small-pox prevailing six or seven centuries over various parts of Asia, having free intercourse with Europe, before it was conveyed into this kingdom. It is indeed surprising, that the dreadful effects which must have attended the first introduction of the small-pox into this as well as any other country, have escaped the notice of all our historians and medical writers. But, by examining some of the MSS. of the Harleian and Cottonian collections, preserved in the British Museum, and bearing indubitable evidence of having been written before the year 900, Dr. Woodville succeeded in tracing the existence of the small-pox in our island, and on the neighbouring continent, long before the crusades took place. In these curious records the word *variole* occurs several times in the same sense in which it is now used. We likewise learn from the MSS. that the people in those early times lived in continual dread of the small-pox, as several prayers, exorcisms, and incantations, to which they had recourse for preservation, are to be found. Dr. Woodville refers us to No. 585, of the Harleian Catal. vol. i. and Bibl. Cotton. Caligula A. 15. No. 30.

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The first British medical writers of any note were those of the 13th century, and they, as well as all their successors, from John of Gaddesden to the immortal Sydenham, &c. have bestowed much attention on this important distemper.

History of Inoculation of the Small-pox.—The exact part of the world where inoculation was first adopted is quite unknown; nor do we possess any information of the circumstances which originally suggested the benefit that might result from the practice. From the Arabian physicians having been the first informed of the nature and treatment of the small-pox, it has been supposed that inoculation had its origin among them. (See Second Memoire sur l'Inoculation par M. de la Condamine.) Avicenna, who lived at Bokhara on the east coast of the Caspian sea, or his disciples, have in particular been suspected of being the authors of this valuable invention, in consequence of the countries between the Caspian and Euxine seas being the supposed centre from which inoculation spread to other places. Dr. Woodville, however, considers this conjecture as very ill-founded. He contends that we have no evidence that any of the people near the Caspian sea were the first practisers of inoculation. Had the invention originated in this part of the world, the Tartars could hardly have been so ignorant of the practice, as, according to D'Entrecolles, they actually were in the year 1724. Nor is it probable that the method spread from west to east; for as the same author has observed, inoculation is more ancient in the eastern parts of China than it is in the western provinces of that empire. Dr. Woodville remarks that inoculation was certainly first introduced into Constantinople from the Morea; but as the event did not take place till towards the end of the 17th century, we may conclude, that, had the art been practised for many ages, at so short a distance from that metropolis, it would have been known there much sooner. Besides, in various countries, very remote from the Caspian sea, it is proved to have been an immemorial usage.

Inoculation was introduced into London as a foreign invention, and, from its success upon the younger branches of the royal family in 1722, became the subject of public conversation, when, to the great surprise of the learned, several communications proved that it was already a practice known in South Wales, where it had existed under the denomination of buying the small-pox as far back as tradition could be traced. The manner of inoculating, or buying the small-pox, here alluded to, was subject to variety. Some persons either rubbed the matter, taken from the pustules, when ripe, on several parts of the skin of the arms, &c. or pricked such parts with pins, or other pointed things, first infected with the same matter. Some scraped the skin with a knife, until the blood began to flow, before they applied the variolous pus. Others produced the distemper by holding a certain number of dried pustules, for a considerable time, in the palm of the hand. (See the Letters of Dr. Williams, Mr. Owen, and Mr. Wright, in the Philosophical Transactions for 1722, and Dr Jurin's account of the success of inoculation in 1723.) The inhabitants of the Highlands of Scotland have also for many ages performed a kind of inoculation by tying worsted threads, moistened with variolous matter, round the wrists of their children. (Monro on Inoculation in Scotland.) The same custom likewise prevailed in many other parts of Europe, Asia, and Africa; and, what is highly curious, the practice was, in several of these distant countries, termed *buying the small-pox*, just as it was in South Wales; for it was superstitiously imagined that inoculation would not produce the proper effect, unless the person from whom the variolous matter was taken received a piece of money, or

some other present, in exchange. The practice of buying the small-pox has been found to have prevailed from time immemorial, not only in South Wales, but also at Naples, Pavia, in Auvergne and Perigord, and among the peasantry in many parts of Germany, Denmark, and Sweden. See Second Mem. sur l'Inoculation, par M. de la Condamine; Murray's *Historia Infectionis Variolarum in Suecia*; Schultz's *Account of Inoculation*, &c.

In Barbary and the Levant the variolous matter was also purchased, and inserted in a small incision made in the fleshy part of the hand between the thumb and the fore-finger. (See Shaw's *Travels into Barbary and the Levant*.) In Tripoli, Tunis, and Algiers, an incision was made on the back of the hand, between the thumb and fore-finger, and a little of the variolous matter put into the wound. According to Dr. P. Ruffel, inoculation is so ancient in these last kingdoms that nobody remembers its first rise; and it has been practised not only by the inhabitants of the towns, but also by the wild Arabs. (See Phil. Trans. vol. lvi. p. 140.) It appears, moreover, from this gentleman's account, that buying the variolous matter and inoculating have been ancient customs at Bagdad, Mosul, and Bassora, in Armenia, at Damascus, and all along the coast of Syria and Palestine. The Arabs assured Dr. Ruffel that the puncture might be made indifferently in any fleshy part; but he mostly found the mark between the thumb and fore-finger. Some of the Georgians had been inoculated in the same part, though most of them in the fore-arm. Some of the Armenians had been inoculated in both thighs; but the greater part, like the Arabs, bore the mark upon the hand.

D'Entrecolles, by obtaining access to several medical books at Pekin, discovered one in which an account was given of the introduction of inoculation into China. The author of the book here alluded to, lived in the latter part of the dynasty of Ming. Hence it has been concluded that inoculation has not yet been practised in China 200 years. But in Hindoostan the custom can be traced much farther back. The methods of practising this art by the Chinese, and Hindoos are also so widely different, that they cannot have been derived from the same origin. The Chinese take from two to four dried variolous pustules, or scales (according to their size), between which they place a small portion of musk; the whole is then wrapped up in cotton, and introduced into the patient's nostril. The scales before used are kept in a close jar for several years, and when the Chinese are obliged to employ recent pustules, they think it necessary to correct the acrimony of the matter, by exposing it to the steam of an infusion of the roots of scorzonera and liquorice. They sometimes reduce the dried scales into powder, and form them into a paste for the purpose of inoculation.

Dr. Woodville very properly observes, that the application of variolous matter, wrapped in cotton, within the nostrils, must be an exceedingly precarious mode of communicating the small-pox, and may perhaps afford a reason why inoculation in China is less successful than in other countries; for if the matter acts in the way of inoculation, a troublesome inflammation of the Schneiderian membrane must ensue; and, should not this take place, the variolous effluvia, by being inhaled into the lungs, will produce the natural small-pox.

In Hindoostan inoculation is performed by a particular tribe of Bramins. They do not refuse to inoculate on any part; but, in males, they prefer the outside of the arm, midway between the wrist and the elbow, and, in females, the shoulder. The operator first rubs the part with a dry cloth for eight or ten minutes, and then slightly pricks it

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at many points. He next takes a small pledget of cotton, charged with the variolous matter, moistens it with two or three drops of the Ganges water, applies it to the punctured part, fixes it there with a bandage, and orders it to be kept on for six hours. The bandage is then to be taken off, the pledget being left to fall off of itself. The matter in the cotton is always taken from pustules of the preceding year, fresh matter, and such as is the product of the natural small-pox, being considered improper. See Holwell's Account of the Manner of inoculating in the East Indies.

It was immediately from Constantinople that the English first derived a full knowledge of the advantages of inoculation. The beneficial consequences of the practice among the Turks, were detailed by Dr. Emanuel Timoni, communicated by Dr. Woodward to the Royal Society, and published in the Transactions of that body for the year 1714. The Byzantine mode was to take some fresh variolous matter in a glass vessel, and drop it on punctures or scratches made with a needle or lancet in any fleshy part, but especially in the arm and fore-arm. The matter, which was dropped on the punctured place, was well blended with the drops of blood issuing from the wounds, by means of a blunt stile or ear-picker. The part was then kept covered with a walnut shell for a few hours, in order to prevent the matter from being rubbed away.

Another account of the Byzantine mode of inoculation was afterwards published by Dr. Pylarini in the same volume of the Transactions of the Royal Society for 1716. But the year before this gentleman's observations appeared, surgeon Kennedy had printed an account of the new method of inoculating at Constantinople, in his "Essay on External Remedies," and he seems to be the first British author on the subject of inoculation. Soon afterwards, lady Mary Wortley Montague, the wife of the English Ambassador at Constantinople, in her letters, confirmed the accounts of the remarkable manner in which the severity and mortality of the small-pox were diminished among the Turks by means of inoculation; and, in one of her epistles from Adrianople, she expressed her intention to try the experiment upon her own little son. See vol. ii. let. 31.

The mode of performing the operation at Constantinople gradually became more and more simple. We learn from Pylarini, that, in 1701, incisions were made in the forehead, cheeks, chin, and also in the extremities, for the purpose of inoculation. Timoni likewise, twelve years afterwards, mentions, that the operator is to make several little wounds in one or more places of the skin, and these succeed best in the fleshy parts of the arm. In the year 1717, the insertion of variolous matter, at a simple puncture in each arm, seems to have been the prevailing method of inoculation, as will appear by the following relation: Mr. Maitland, surgeon to the honourable Wortley Montague in his diplomatic character at the Ottoman court, informs us, that the ambassador's lady, being convinced of the advantages of inoculation, determined that her only son, then six years of age, should undergo the operation. For this purpose, she desired Mr. Maitland to procure the variolous matter from a proper subject, which being done, an old Greek woman, many years in the constant habit of inoculating, was employed to insert it. "But (says Mr. Maitland) the good woman went to work so awkwardly, and, by the shaking of her hand, put the child to so much torture with her blunt and rusty needle, that I pitied his cries, and therefore inoculated the *other arm* with my own instrument, and with so little pain to him, that he did not in the least complain of it." (Maitland's Account of Inoculating the Small-pox, p. 7.) The consequent disease was very mild, and, if the mode of buying the small-

pox be excepted, this inoculation, which was done at Pera, near Constantinople, in March 1717, was the first ever practised upon any English subject.

The inoculation of the small-pox was first regularly adopted in England in the month of April 1721. The practice, in all probability, would not have been so soon pursued by the faculty, had it not been for the enlightened and philosophic mind of lady Mary Wortley Montague. After this celebrated lady had witnessed the good effects of inoculation upon her son at Pera, she determined also to try it upon her daughter, then an infant three months old; but for certain domestic reasons, the operation was at that time deferred, so that this child was fortunately referred to be the first example of inoculation in England, which was done by Mr. Maitland, in April 1721. According to Dr. Woodville, writers have universally erred, in dating this event in April 1722, and making it subsequent to the inoculation of the malefactors at Newgate. He notices that Mr. Maitland's pamphlet, in which all the circumstances are stated, was published in February 1722, as appears by the advertisement prefixed to the work. Therefore Mr. Maitland, in saying April 1722, could mean no other than that in the year 1721. Besides, Mr. Maitland expressly mentions, that this was the first example of inoculation in England.

After the successful result of this case, Mr. Maitland performed the second inoculation ever done in this country, in the month of May 1721, upon the son of Dr. Keith, and with the best effects. Notwithstanding these confirmations at home of the favourable accounts of the practice which had been already received from Constantinople, and notwithstanding the firm and powerful patronage which the Byzantine inoculation met with in lady Mary Wortley Montague, it is a fact, that such was the suspicious caution with which the method was received, that several months elapsed before a third trial of it was made in London. Indeed, the very next experiment that was undertaken strikingly evinces the dangerous light in which inoculation was still regarded; for it was determined that several culprits in Newgate, who had forfeited their lives to the laws of their country, should, on submitting to be inoculated, receive full pardon by the royal prerogative. Six condemned criminals were inoculated by Mr. Maitland, on the ninth day of August 1721, in the presence of several eminent physicians and surgeons. These malefactors all obtained a remission of their sentence on very easy terms. None of them had the disease severely, and one, who had already had the small-pox, was of course not affected a second time. A seventh criminal, a young woman, was next pardoned, on condition of having the Chinese method of inoculating tried upon her, at the wish of Dr. Mead. Consequently, some cotton, moistened with variolous matter, was introduced in her nostrils; the distemper followed in a mild form: but the patient suffered violent pains in her head, from the commencement of the eruption to the maturation of the pustules.

After these public proofs of the safety and advantage of inoculation, objections and doubts were still adduced against the method. Some considered the cases too few, while others, in consequence of the small number and mildness of the pustules, thought it doubtful whether the genuine small-pox had been at all communicated. Hence, in the course of the following six months, Mr. Maitland inoculated only eight subjects, who all recovered, though two, it must be confessed, had the small-pox so severely, as to be for some time in danger. See Maitland's Account of Inoculating the Small-pox, 1722.

Maitland's publication was immediately afterwards followed by a letter from Dr. Nettleton, who, in December

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1721, and the two subsequent months, had inoculated with success upwards of forty persons at Halifax, in Yorkshire. This relation influenced the public very considerably in favour of the new mode of communicating the small-pox.

Early in the spring of the year 1722, inoculation began to be adopted in various parts of England; and by order of her royal highness the princess of Wales, it was practised first upon six, and afterwards upon five charity children; belonging to the parish of St. James's. The success of these trials induced her royal highness to have the princesses Amelia and Carolina inoculated on the nineteenth of April 1722, by serjeant surgeon Amyand. Both these younger branches of the royal family passed through the small-pox, in a very favourable manner; and inoculation, in consequence of this illustrious example, was now making a rapid progress: when unfortunately the practice received a great check, by the death of the earl of Sunderland's son, and by that of lord Bathurst's servant, after being inoculated. A Miss Rigby also died, about eight weeks after her inoculation, making the third death. Therefore, out of 182 inoculations, in 1721 and 1722, three died; or nearly one in sixty.

About the time when the first death happened in London, accounts were received in town, stating that the practice had been tried to a much greater extent in New England. It appears that, after an absence of nineteen years, the small-pox had broken out with a great mortality at Boston, in April 1721. This induced the Rev. Mr. Mather to publish the account of inoculation, as related in the Philosophical Transactions by Timoni and Pylarini. This publication, which was distributed to all the medical practitioners at that place, was the means of inciting Dr. Boylston to commence the practice of inoculation upon his own child, and two negro servants, at the latter end of June 1721. In the course of six months, he inoculated in and about Boston 244 persons. Of this number six died.

The reports which came from New England, were employed with great exaggeration by the opponents of inoculation, who seized with avidity every circumstance that might have the least tendency to retard the progress of the improvement.

During 1723, the practice of inoculation became much more general in England, the number of inoculated this year far exceeding the numbers in the two preceding years taken together. It amounted to 292, which, added to 182, makes the whole number of inoculations in the years 1721, 1722, and 1723, to be 474, of which number, according to Dr. Jurin, nine died.

It deserves notice, that several of these nine cases were not generally admitted as deaths altogether in consequence of inoculation. But even allowing that they were so, the chance of recovering from the inoculated small-pox must appear infinitely greater than from the casual. For it was proved, that at this time, out of 14,559 persons who had been affected with the natural small-pox, 2351 died; nearly one in six, or five out of thirty-one.

In 1724, there were only forty persons inoculated. Their royal highnesses prince Frederick and prince William, however, were in this small list. Dr. Jurin accounts for the seeming decline of inoculation this year, by the fact that people will not easily submit to a practice in which they apprehend risk, unless impelled by the dread of a greater danger. Now it appears that in 1724, the natural small-pox was much less fatal than in 1722 and 1723, and it is to this cause we are to refer the above small number of inoculations. That the practice had not fallen into disrepute is manifest; for Dr. Jurin informs us that in 1725 the natural small-pox was very mortal, and of course, people being frightened, resorted to

inoculation again in a larger number. Of the above-mentioned forty, one is recorded to have died.

In 1725 and 1726, 256 persons were inoculated, of which number four died.

In the years 1727 and 1728, the practice of inoculation did in reality begin to decline; for, though the small-pox was very prevalent and fatal, only 124 inoculations took place in these two years, and three of the cases proved fatal.

We find that up to 1729, 897 persons had been inoculated in England, of whom seventeen are reported to have died. But on the other hand, the records shew, that of 18,229 persons, who had been affected with the natural small-pox, during the first eight years of inoculation, 3008 died under the disease; or about one in six; whereas, the deaths by inoculation, admitting the utmost number contended for, does not exceed one in fifty. The reason why more died of inoculation at this early period of the practice than has been the case of late years, is justly ascribable to the better manner lately adopted of treating inoculated patients. Besides, formerly it was common to inoculate adults, in whom the disease is more disposed to assume a severe form than in children.

Inoculation was not regularly practised in Scotland till the year 1726, when Mr. Maitland performed this operation upon ten persons; but as one of these cases was unsuccessful, the practice was discontinued in that country for twenty years afterwards, and was not revived again without considerable difficulty. At Dumfries, indeed, where the casual small-pox had committed great ravages, inoculation was had recourse to in 1733; but in most other parts of North Britain the method was not introduced till 1753.

In Ireland, inoculation was first performed at Dublin in 1723. Twenty-five persons were inoculated in that and the three following years. Of this small number, three cases terminated fatally.

Inoculation at Hanover was first performed in 1724, by Mr. Maitland, upon his royal highness prince Frederick, and afterwards upon eight children of the Baron de Schulerberg. The example and success of these cases had the effect of establishing the practice in that country.

After 1729, inoculation was seriously on the decline in England; but it made considerable progress in the transatlantic world. In South Carolina, about the year 1738, not less than 800, or 1000 persons were inoculated, of whom only eight died. The account of this success contributed materially to revive the practice in Great Britain. In Philadelphia, likewise, inoculation proved soon afterwards still more favourable; and in St. Christopher's 300 slaves were inoculated, without the loss of one.

Such facts in favour of the practice, and the great fatality of the natural small-pox in Britain, soon led people to adopt inoculation more extensively than ever, and from the year 1738, this beneficial method may be regarded as having been completely and generally established, though partial opposition prevailed long afterwards.

In the year 1746, the institution called the Inoculation Hospital had its rise, though it was not at first so considerable an establishment as at present. Here the success of inoculation did not disappoint the hopes and zeal of its patrons; for out of 593 cases of persons successively inoculated, from the year 1751, only one proved unsuccessful.

In 1754, it was determined to inoculate the three royal children, who had not yet had the small-pox. In the mean time, his present majesty took the disease casually, so that only the prince Edward, and the princess Augusta, were inoculated.

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inoculated. These great examples, and the public approbation of the practice declared by the College of Physicians, gained numerous advocates to the cause, which never afterwards lost ground, till the still safer and milder mode of inoculation with vaccine lymph was brought into notice by the immortal Jenner.

In France, Dr. Boyer is the first writer who has noticed inoculation, which he did in 1717. In 1723, the successful trials of inoculation in England were published at Paris by Dr. de la Cotte, and the consequence was a declaration by the physicians of that city, "that for the benefit of the public, it was lawful to make trials of inoculation." The practice was on the point of having a beginning in the hospitals, under the sanction of the duke of Orleans, the regent, when, unfortunately for the experiment, this nobleman died, and soon afterwards Dr. Hecquet published his "*Raifons de doute contre l'Inoculation*." The sentiments contained in this publication, and in a thesis written at Paris in 1723, the reports of the ill success of inoculation at Boston, and the great mortality of the natural small-pox in London, in 1723, falsely ascribed to the new practice, soon brought the method into disrepute in France, and the design of trying it there was laid aside.

The French paid little attention to the subject again till 1752, when Dr. Battini, of Montpellier, published at Paris his "*Traité de la Petite Verole communiquée par l'Inoculation*." Two years afterwards, M. de la Condamine read his excellent memoir upon the advantages of inoculation, before a public assembly of the Royal Academy of Sciences at Paris. But, according to Dr. Woodville, the practice was not introduced into France till the 1st of April 1755, when, at the desire of M. Turgot, a child, four years old, was inoculated at Paris. On the 14th of May, M. Chastellux, aged 21, voluntarily submitted to the operation. About this time, Dr. Hesty, who had been attending the small-pox and inoculation hospitals in London, at the request of the French minister, published at Paris the following report:—"That out of 463 cases of persons last inoculated in the hospital, only one had been unsuccessful; whereas, in the Small-pox hospital, it appeared by the registers, that nearly one in four had died of the natural small-pox."—"That Mr. Ranby, principal surgeon to his majesty, had inoculated 1600 persons; and that Mr. Bell, pupil to Mr. Morand, had inoculated 903, without the loss of one."—"That in order to form a just comparative view of the fatality of inoculation and of the natural small-pox, it is only requisite to visit the two hospitals in London, the difference of their reports being so remarkable, that it must convince the most incredulous of the advantages of inoculation." Lastly, "with respect to the inoculation of other diseases along with the small-pox, that no instance of the kind has ever been produced; and that persons have been inoculated with variolous matter, taken from a patient affected with the venereal distemper, yet have thereby received the infection of the small-pox only."

This statement had immense effect in promoting the introduction of inoculation into France; and in the year 1756, the family of the duke of Orleans, and great numbers of the first rank, were inoculated by Drs. Tronchin, Hesty, and others. In 1758, the practice had diffused itself over various parts of France. The inoculated were not, however, very numerous, and one or two unsuccessful cases, joined with false reports, that some persons had taken the natural small-pox after undergoing inoculation, once more cast discredit upon the plan, and excited a violent controversy. The great fatality of the small-pox at Paris in 1763, being imputed to inoculation, the practice was forbidden by parlia-

ment. At length the faculty of physic, and that of theology, were called upon to decide, whether inoculation ought to be tolerated or proscribed. This measure served to increase the disputes; nor was it till a very late period that inoculation was extensively practised in France.

In Holland, inoculation was begun at Amsterdam in 1748 by Dr. Tronchin, who, on finding one of his sons seized with the natural small-pox, immediately inoculated the other. This physician, after his return from Geneva, in 1754, inoculated a great many persons in Holland. Dr. Schwenke, at the Hague, likewise promoted the practice; and so did a society of physicians and surgeons at Rotterdam, who were associated for the purpose in 1757. The method was not, however, very generally adopted by the Dutch, till after 1764, about which time Morand and others had practised it at Amsterdam with striking success.

Inoculation was first introduced into Denmark in September 1754, when the countess of Bernsdorff underwent the process. In 1758, two inoculation houses were established at Copenhagen; and, in 1760, the prince royal was inoculated with success.

In Sweden, the first trial of inoculation was made by Haartman in 1754. The rapid progress of the method in Sweden was owing to the encouragement afforded by the Swedish court. Dr. D. Schultze was deputed to enquire into the success of the plan at the inoculation hospital in London, and the accounts which he gave upon his return to Stockholm in 1755, led to the establishment of inoculation houses in different parts of Sweden. In 1757, the benefits of inoculation were commemorated by a medal.

Inoculation was first introduced at Geneva in 1751, whence it passed into Switzerland in 1753. In the latter country, it was first performed at Lausanne by a lady on her own child.

Inoculation commenced in Italy during the great mortality occasioned in Tuscany and Rome by the small-pox in 1754. Dr. Peverini was the first inoculator, putting out of consideration the custom which had long prevailed in the interior of the country, of women sometimes artificially communicating the small-pox to their children. In 1755, M. de la Condamine was at Rome, where, by his writings and personal influence, he succeeded in reconciling many to the practice. Before 1765, inoculation was practised with success at Venice, Padua, Verona, Brescia, Mantua, Bologna, Milan, Parma, &c. In short, Naples was the only important place where the method had not been introduced.

Inoculation was begun at Hanover almost as soon as in England. The opposition of De Haen, however, kept back the improvement in most other parts of Germany. The Prussians and Austrians were the last to adopt it. At Vienna, inoculation did not make any progress till 1765. The younger branches of the imperial family were inoculated in 1768, and shortly afterwards the emperor established an inoculation hospital in the suburbs of Vienna.

Owing to some unfortunate events of the first inoculations at Berlin, the practice was soon discontinued in Prussia, nor was it revived till 1774, when Dr. Baylies was invited from Dresden to superintend the method.

Although some persons had been inoculated in Livonia by Dr. Schulenius at an earlier period, the practice was unknown at St. Petersburg till 1768, when it was established there under baron Dimsdale. This event must have been to the Russians an immense blessing, since in their country, the natural small-pox used to rage with such severity, that it is said to have annually destroyed two millions of subjects. On the 28th of July, 1768, baron Dimsdale inoculated the empress and the grand duke, both of whom speedily recovered.

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The practice made rapid progress; an inoculation hospital was established; and at length Dimdale returned to England loaded with wealth and honours.

In Spain, inoculation was not extensively adopted before 1771, though it had been introduced by a surgeon forty-two years before at Jadrique, a small town in that kingdom, and had not been discontinued in that particular place. Dr. Don Miguel Gorman visited London for the purpose of learning the Suttonian method of inoculation, and returned to Madrid in 1772, where he practised the art upon several of the nobility to the great satisfaction of the court.

Of the Objections which were urged against Inoculation.—Having related the rise and first progress of inoculation in several parts of the world, it seems proper, before reciting the particular methods pursued by the Suttons and baron Dimdale, to notice the various objections and arguments which were adduced for the purpose of suppressing the practice of inoculation altogether. The clamour against the method, indeed, was for many years excessively violent; both physical and moral reasons were brought forward against the system, and men of different professions entered into the controversy.

1. To the objection that inoculation did not produce the genuine small-pox, and consequently could not secure any one from having the disease afterwards, the celebrated Dr. Mead made the following judicious reply. "Now I own I cannot understand how contagion, that is the very seed of the disease, should produce not its own proper distemper, but another of a different kind. Neither, certainly, does it matter by which way the infection is received, provided it brings forth manifest marks of the disease. And as to those, who, after having been inoculated with success, are, notwithstanding this, said to have suffered the small-pox, I must protest that, after the most diligent enquiry, I have not been able to find out one convincing proof of this kind. But to speak plainly, if such a thing happened once, why do we not see it come to pass oftener? Or, what can a single example, supposing it to be true and certain, avail, when innumerable have produced nothing like it?"

2. One formidable objection was, the supposed danger that inoculation might be the means of communicating other terrible and fatal diseases, when the matter was taken from unhealthy subjects. The variolous matter being a poison *sui generis*, it cannot by inoculation communicate any other distemper. The venereal disease is known to be as communicable as any, yet several persons have been inoculated from patients labouring under considerable degrees of the venereal disease, and no ill consequences were ever yet known to follow. Mr. Burge's informs us that he knew of one instance where the matter was inadvertently taken by a surgeon from a young woman, who fell ill of the small-pox, after being admitted into St. Thomas's hospital to be salivated. Three patients were inoculated from this matter, and had the small-pox in the most favourable manner. Nothing particular happened about the wounds, and the patients all grew up healthy subjects. See Burge's "Account of the Preparation and Management necessary to Inoculation, 1754." Dr. Kirkpatrick also mentions in his "Analysis of Inoculation," that he was assured by a respectable surgeon, that a young lady was inoculated by an apothecary from a gentleman's servant, who had a venereal bubo together with the small-pox. The lady, notwithstanding, did very well, and never had the slightest symptom of venereal infection. The assertion, then, that other diseases may be communicated by inoculation remains quite unproved. That other diseases may follow the small-pox no man of common sense will deny; for it is no security against them. Nay, the debility which

it sometimes induces, may even promote the accession of scrofula, consumption, &c.; but since inoculation tends so materially to diminish the severity of the small-pox, it must also have a great effect in lessening and preventing any circumstances, which are to be regarded as consequences of such severity.

3. Perhaps the disease may never attack in the natural way. This objection, one would think, must give way to the bare statement, that, previous to the practice of inoculation, the casual small-pox annually destroyed about two millions of lives in the Russian empire alone, and committed equal devastation in several other parts of the world. It has been observed by Dr. Jurin, in an ingenious paper inserted in the Philosophical Transactions, that it is difficult to ascertain the exact number who die without having the small-pox; but that of all the children that are born, there will, some time or another, die of the small-pox one in fourteen; and that of persons of all ages taken ill of the same distemper, two in eleven will fall victims to it.

From a table of burials it appears that in Edinburgh and St. Cuthbert's parish, during ten years, about one-tenth of the dead was killed by the small-pox.

It may likewise be noticed, that no individual is originally unsusceptible of the small-pox, and though a proportion of mankind might possibly escape the contagion, still the number of victims to the disorder casually taken would be very considerable. During the controversies concerning the advantages and disadvantages of inoculation, enquiries were made from house to house, in several towns, in order to ascertain the number of people, who had had the small-pox in one twelvemonth, when it appeared that nearly one died in every five who had taken the disease; and that of eighty-two persons who were inoculated in these places in the same year, not one died.

Dr. Nettleton, Dr. Whitaker, and some others, made an attempt to find out how many persons had had the small-pox, and how many had died of it in the year 1722. The result was as follows:

	Sick of the Small-pox.	Died.
In several towns in Yorkshire	3405	636
Chichester - - -	994	168
Haverfordwest - - -	227	52
Total - - -	4626	856

This table will serve to depict the general event of the casual small-pox. The mortality was considerable; but it was even much greater at some periods, and in particular parts of the world. On the other hand, inoculation has sometimes been pursued with such remarkable success, that out of a thousand persons inoculated one after the other, scarcely one has perished.

We shall not swell this article with a detail of the numerous physical reasons urged against inoculation, the present state of knowledge renders such a task unnecessary; and all the objections alluded to, have been so often and completely proved to be frivolous and unfounded, that of late years the practice has encountered no opposition, if we put out of present consideration the praiseworthy endeavours to substitute every where the vaccine for the variolous inoculation.

4. The moral and religious objections which were adduced against the practice of inoculation, gave rise to as much dispute as the medical differences of opinion, and certainly operated still more perniciously in prejudicing the minds of people

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people against the art. The plan of bringing diseases upon ourselves, was represented as a Circassian impiety, altogether irreconcilable to a Christian conscience. Those who adopted the practice were branded with the appellations of poisoners and murderers, and were said to be intigated by atheism, quackery, and avarice. One anonymous writer implored the interference of parliament. He observes, "while this hellish principle has so much hold upon mankind, 'tis highly necessary that there should be no doors left open for the practice, at least none that can be shut; that there should be no room for the covering of such horrid things from the reach of the law. Physicians they have already too much latitude in practice, to make havoc of mankind for the satisfaction of their judgment in physic, and increase of their experience; but every quack now may be a hireling to the devil, and, like that banditti in Italy, be ready to do the drudgery of removing heirs, and other obstructing incumbents of many kinds, and to do this under the mask of a cure, inoculating death instead of a disease, and making use of an art never before practised, in a manner not foreseen, and by the laws not yet sufficiently guarded against." See a pamphlet entitled "The new Practice of Inoculation considered, and an humble Application to the approaching Parliament for the Regulation of that dangerous Experiment, 1722."

A sermon was preached on Sunday, July 8th, 1722, against inoculation, at St. Andrew's church, Holborn, by the Rev. Mr. Mafsey. His text was "So went Satan forth from the presence of the Lord, and smote Job with sore boils from the sole of his foot unto his crown," chap. ii. v. 78. In this discourse, the Devil was depicted as having first put inoculation in practice upon Job. Inoculation was stigmatized as a diabolical operation, and an anti-providential project, that insults our religion, and banishes providence out of the world.

It is almost unnecessary for us to say, that Job's being afflicted with the small-pox was nothing more than an unwarrantable assertion, and a whimsical conceit of the Rev. Divine. The following epigram on the subject appeared in the Monthly Miscellany for March 1774.

We're told, by one of the black robe,
The Devil inoculated Job;
Suppose 'tis true, what he does tell,
Pray neighbours, did not Job do well?

Dr. Wagstaffe had asserted, that it never came into men's heads to take the work out of nature's hands, and raise distempers by art in the human body. (See "Letter shewing the Danger and Uncertainty of inoculating the Small-pox.") To this Mr. Maitland replied in his Vindication, "that the practice of physic is founded upon the principle of curing *natural* by raising *artificial* diseases. What is bleeding, but an artificial hemorrhagy; purging, but raising an artificial diarrhoea? Are not blisters, issues, and setons, artificial imposthumations?"

The virulence and farcisin by which the opposers of inoculation were actuated, are well exhibited in the rejoinder, made by another writer, to the foregoing very sensible observation. "Very good, sir, but go on,—what is correction at the cart's tail, but the noble art of muscular phlebotomy? What is burning in the hand, but the art of applying a caustic? What is hanging but an artificial quinzey, which makes the patient feel for the ground, and chokes him? What is breaking on the wheel, but the art of making dislocations and fractures, and differs from the wounds and amputations of surgeons only by the manner and intention?"

—A Short and Plain Account of Inoculation, &c. by I. Mafsey.

Dr. Maddox, bishop of Worcester, was an able and zealous friend to the cause of inoculation, and preached an excellent sermon in support of the practice. He observed, that it was needless to enter into a disquisition, which is the most proper method of designedly raising the small-pox in the human frame, by carrying the person that is to receive it to the contagious steams, or effluvia; or bringing to him the infected matter. Religious difficulties (if any still remain, concerning a practice that has preserved so many lives, and prevented the heaviest grief in so many families,) are exactly the same, in either method of voluntary communication.

For it is no more invading the prerogative of heaven to occasion one easy and voluntary conveyance of the infection than another, by a slight and hardly sensible rasure upon the arm, than communicating the same distemper, by invisible particles, to that tender organ the lungs, which are so frequently affected by the venom of this disease, when contracted by the breath, or receiving into the body infected particles in what is called the natural way.

Were this preventive method (continues the learned prelate) universally successful, and never once to fail in any instance whatsoever, it is scarcely to be presumed that any objection would be raised against a salutary expedient, to preserve from destruction so great a part of the human species as daily fall by this mortal enemy, when it attacks men as it were in the dark, ignorant of, and unprepared for the assault.

This method of inoculation would then be no more liable to censure than the making a voluntary wound, by incision, to form a necessary drain; or administering any operative medicine, which, upon repeated trials, had proved an unfailling security against any other dangerous and prevailing pestilence or contagion.

But, in order to excite and secure a dependence upon his divine providence, the great Governor of the world has appointed that no human affairs, not even our necessary sustenance, should be attended with such absolute certainty: a very wise appointment, that vain man might not fancy himself an independent being; but, among all the changes and chances of this mortal life, should still look up unto, because he can only be defended by, God's most gracious and ready help.

Experience alone must determine the good or bad consequences of this artificial infection, as it ought to do in all other medical attempts, which, in many instances, are, in reality, little more than curing or alleviating one distemper, by exciting or introducing another. And, in this view, the method now under consideration, of lessening the hazard of a very mortal disease, should be considered in the same light as every other antidote, or preventive attempt in physic or surgery, against any probable, almost certain malady, internal or external.

The philanthropic prelate forbore to derive any strength to the argument, from the great number of noble, venerable, and worthy persons, of every rank and profession, who were in his time the public advocates of this compassionate design: he wished to stand upon its own proper evidence and foundation.

He remarked, that a safe passage through this distemper, like the emancipating slaves, is a deliverance to vast numbers of people kept, as it were, in bondage; who, before they have undergone this abhorred disease, are excluded from many offices in life, and prevented from pursuing their necessary business; and it gives tranquillity and cheerfulness

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to persons of better condition, who, under apprehension of this loathsome and infectious disorder, were all their former days subject to great anxiety and constant fear.

The bishop commented with great ability upon the advantage that inoculation affords of communicating the small-pox at the most favourable time of life, *viz.* infancy, when the disease is most inclined to put on a mild form. He mentioned, authentically, that, out of 1500 persons inoculated by Mr. serjeant Ranby, Mr. serjeant Hawkins, and Mr. Middleton, only three died.

He stated to his congregation, that, from the annual account within the bills of mortality, (in which many places in and near the city were omitted,) it appeared that, in twenty years, *viz.* from the year 1731 to the year 1750, inclusive, no less than 39,115 persons died of this fatal distemper; which, including the places not inserted in the weekly bills, must have been considerably more than 2000 every year, that fell in the two adjoining cities and parts adjacent. And, he noticed, that if only one in seven is supposed to die by the distemper taken in the natural way, then the whole number of persons who, in this period of twenty years, were thus infected, must have amounted to 280,000, of which number no less than 40,000 perished. But if one in every 200 should be supposed to die under inoculation, which is really more than fall by that artificial infection, instead of 40,000, only 1400 would have died in one district in twenty years, had inoculation been universally adopted. Thus the difference in that short period, in one spot, would have been no less than 38,600 lives preserved, besides the numerous posterity that might have been derived from them.

The learned divine insisted, that humanity, regard to our country, the dictates of reason, and the precepts of religion, are all in favour of the system of inoculation.

During the opposition to the introduction of inoculation, many affected to be actuated against it by religious scruples, and the practice was alleged to be unlawful.

In answer to this, the scriptures ask, Is it lawful to save life, or to destroy it? Luke, vi. 9. We should also remember, that, as the fall of man brought the danger of diseases into the world, so to evade, oppose, or destroy it, is not only his right, but duty, if in his power. When danger surrounds us, no conduct is more proper than to inquire into, and pursue the means of escape. To neglect our safety is to sink below brutes, which are taught by instinct to shun the evil to which they are exposed. Inoculation is certainly in many instances a means of saving life, and of moderating the severity of affliction. And, in a moral point of view, wilfully neglecting the means of preserving life must appear almost as bad as the guilt of murder.

The bringing of a distemper on ourselves was likewise represented by bigotted individuals as usurping the sacred prerogative of God.

As to the first part of this objection, if by distempers are meant sickness and pain, the same thing is practised daily in other instances, in concurrence with the scripture dictate, *viz.* of two evils choose the least. Inoculation is not done from a mere wanton desire of imparting any disease, but is performed in order that the patient may go through an unavoidable distemper with the least difficulty, and the greatest chance of recovery. The natural small-pox being highly perilous, it must be a great desideratum to avoid it, and inoculation enables us to do so, by destroying that disposition in the body, without which the disease cannot take place.

Respecting the offence given to God, a reliance on providence does not imply that we are not to prevent or oppose the evils which we foresee, and which we have in our

power to guard against by prudent precautions. Would these objectors, in other instances, refuse the means of lessening the malignancy and danger of disease, than which the practice of inoculation is no more? Let the assertors of the rights of God say, whether, when God permits the discovery of preserving ourselves, he forbids our using it? If our Maker offers us a remedy, it is offending him to reject it.

It was moreover objected, that the decrees of God have fixed the commission of every disease, and that our precaution cannot prevent what He has determined.

To this it was answered, that, however true it is, our days are determined, &c. yet it is God's revealed will, and not his secret purposes, which we are to regard as the rule of duty. God has required of us to have a tender regard of our lives; and they who disobey him therein are guilty of a degree of self-murder, and will never be acquitted of that guilt by the secret determination of Heaven concerning them. Besides, God, who has ordained the end, has also determined the means leading to it. St. Paul, in his dangerous voyage, had a special revelation to assure him, that all who were with him should escape; and yet, when the seamen were getting out of the ship, he declares, that if they did not stay in it they could not be saved. Acts, xxvii. 31. God purposed to preserve them in the way whereby they were afterwards delivered.

It was likewise contended that we ought not to do evil, that good may come.

On the other hand, it was acknowledged, that if inoculation is, in its own nature, a moral evil, it certainly should be rejected, however great its advantages may seem to be. The prospect of relief from any calamity in life should not tempt us to offend God. But they who make the foregoing objection proceed upon a mistake. Their principle is true with regard to moral evil, but is not so when applied to physical. It is certainly lawful to pull down one house to save a great number from being burnt. This is a physical evil, which can hardly take place without some degree of moral evil: and many other instances may be pointed out, where, for a greater good, a lesser ill is submitted to.

It was further objected, that the patient might die, and then his last moments would be distressed, and the future reflections of his friends grievous.

This objection led many to decline the practice of inoculation, even while they allowed the theory of it to be reasonable. They entertained hopes of escaping the distemper in the natural way, and they had fears of dying in this, and thus they were prevented from undergoing the disorder. But they should have considered what grounds they had for either their hopes or fears, and what was to be advanced to balance the account, in an examination of the different degrees of probability attendant on what they hoped for, and what they were afraid of, in the neglect or adoption of inoculation. Dying is an awful thing; but if inoculation was a *probable and lawful* means of preserving life in a time of danger, it was a duty to comply with it; and what reflection could be more peaceful than that of dying in the way of duty?

It was further objected by the religious opposers of the new practice, that fear was a dangerous passion in the small-pox, and that inoculation increased the causes of fear, by lessening our faith and trust in God.

When the small-pox was left to nature, such were its ravages, that, not to fear, would have been to sink beneath humanity: its consequences were too grievous to be viewed with indifference. Experience manifested the advantages
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and general safety of receiving the disease by inoculation, and so far the practice was a remedy to that just alarm which enhanced the danger, when the distemper was left to itself. As to faith in God, none was desirable, except that which was agreeable to the scripture, and which could never have the effect of creating a disregard to calamities and danger. Inoculation was well proved to be a means of safety, and it would have been as rational to conclude that our lives could be preserved without eating and drinking, as that we should be delivered from danger without a prudent care for our own safety. We are to depend on the care of providence only in the way of duty. To boast of courage and trust in God, while we omit the means of escaping danger which surrounds us, is not faith but presumption.

Thus, when inoculation became a probable means by which life might be saved, the neglect of it, so far from being trust, was presumption.

We shall now take our leave of these theological disputes and scruples, which have now been long removed by the influence of right reason and sound sense. When it was once well ascertained and universally believed that inoculation was really a means of preserving life, the idea of its being criminal to adopt the practice could not have much duration. A very able discussion of most of the foregoing objections was published in a pamphlet, entitled "Inoculation impartially considered, and proved to be consistent with Reason and Revelation," by the Rev. David Some, edited by Dr. Doddridge, 1750.

Of Inoculation, as practised by the Suttons, Baron Dimsdale, &c.—The introduction of the Suttonian practice was regarded quite as a new era in the history of inoculation, from the novelty of the method, and its unparalleled success.

Mr. Robert Sutton, the first of this name, who acquired celebrity as an inoculator, resided at Debenham in Suffolk, where he practised surgery and pharmacy. From the year 1757 to 1767, he inoculated 2514 persons.

Two of his sons, Robert and Daniel, followed the medical profession, and after assisting him during the three first years of his practice of inoculation, Robert established himself as an inoculator at Bury St. Edmund's, while Daniel became assistant to Mr. Bumstead, a surgeon at Oxford. Daniel, on his return to Debenham, in the year 1763, suggested to his father a new plan of inoculation, in which he proposed to shorten the time of preparation to a few days, and not to confine the inoculated patients to the house, but to oblige them to be in the open air as much as possible during the whole progress of the distemper.

The father condemned this scheme as rash and dangerous. Its advantages, however, soon becoming manifest to patients, they evinced a desire of being solely under the management of Mr. D. Sutton. The consequence was, that the father and son separated about the end of the year 1763, when the latter opened an inoculating-house near Ingatestone, in Essex. Here, by public advertisements, he made known his plan of inoculating in an improved way peculiar to himself. The encouragement which he met with may be estimated from his receiving, during the first year, 2000 guineas, and above 6000 the second. His fame spread to the most distant parts of the kingdom; and the numbers that resorted to him for inoculation, constantly filled the village of Ingatestone, so that accommodations could hardly be procured for the purpose. His practice in Kent being also very extensive, he was obliged to employ several medical assistants. In 1767, Mr. D. Sutton removed to London, in hopes of reaping still more emolument; but his receipt fell far short of his expectation.

According to Mr. Houlton's statement, the number of persons inoculated by Mr. Daniel Sutton in the year

1764	was	1629
1765	—	4347
1766	—	7816

13,792

"To the above number," says he, "should be added 6000 that have been inoculated by Mr. Sutton's assistants; so that he may be said to have inoculated, within these three years, 20,000 persons."

Of this number, not one was allowed to have fairly died of inoculation. The venal pen of the preceding writer certainly exaggerated every thing, and great boast was also falsely made of the Suttons having a specific medicine for preventing too many pustules. However, no doubt was entertained that the Suttonian practice was incomparably more successful than any other.

Medical practitioners, struck with the advantages of the new treatment, set about the investigation of the causes. Sir George Baker published the following account of the manner in which Mr. D. Sutton practised inoculation. "All persons are obliged to go through a strict preparatory regimen for a fortnight before the operation is performed. During this course, every kind of animal food, milk only excepted, and all fermented liquors and spices are forbidden. Fruit of all sorts is allowed, except only on those days when a purging medicine is taken. In this fortnight of preparation, a dose of a powder is ordered to be taken at bed-time, three several times; and on the following morning a dose of purging salt. To children, only three doses of the powder are given, without any purging salt. The composition of this powder is industriously kept a secret. But, that it consists partly of a mercurial preparation, is demonstrated by its having made the gums of several people sore, and even salivated others. The months of May, June, July, and August, are preferred as the most seasonable for inoculation. But healthy people are inoculated at any season of the year indifferently. The autumn is held to be the worst season; and an aguish habit the least proper for this operation. No objection is made to any one on account of what is vulgarly called a scorbutic habit of body, or bad blood. The person who is to be inoculated, on his arrival at the house used for this purpose, is carried into a public room, where, very probably, he may meet a large company assembled under the several stages of the small-pox. The operator then opens a pustule of one of the company, choosing one where the matter is in a crude state; and then just raises up the cuticle on the outer part of the arm, where it is thickest, with his moist lancet. This done, he only presses down the raised cuticle with his finger, and applies neither plaster nor bandage. What is extremely remarkable, he frequently inoculates people with the moisture taken from the arm before the eruption of the small-pox, nay, within four days after the operation has been performed. And," says Sir G. Baker, "I am informed, at present he gives the preference to this method. He has attempted to inoculate by means of the blood; but without success. If the operator happeneth not to be at home when the new patient arriveth, this is looked upon as a matter of no importance. And so far is he from any apprehension of accumulating infection, that it is very common for persons, just inoculated, to lie in the same bed with a patient under any stage of the disease, as it may happen; nay, sometimes in a room where four or five people are sick. On the night following the operation, the patient takes a pill. This medicine is repeated every other night, until

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until the fever comes on. All this time, moderate exercise in the air is strongly recommended. In twenty-four hours after the inoculation, the operator can often distinguish whether or no the patient be infected. He every day examines the incision; and from hence seems to prognosticate, with some degree of certainty, concerning the degree of the future disease. In three days after the operation (provided that it has succeeded), there appears on the incision a spot like a flea-bite, not as yet above the skin. This spot, by degrees, rises to a red pimple; and then becomes a bladder full of clear lymph. This advanceeth to maturation like the variolous pustules, but is the last which falleth off. In proportion as the discolouration round the place of the incision is greater, the less quantity of eruption is expected. And, therefore, whenever only a small discoloured circle is observed, purging medicines, more than ordinary, and more frequently repeated, are held to be necessary.

"The preparatory diet is still continued. If the fever remains some hours without any tendency to perspiration, some acid drops are administered, the effect of which is to bring on a profuse sweat; but in some cases where the fever is very high, a powder or pill, still more powerful, is given. In general, during the burning heat of the fever, the inoculator gives cold water. But the perspiration beginning, he orders warm balm-tea or thin water-gruel. As soon as the sweat abates, the eruption having made its first appearance, he obliges every body to get up, to walk about the house, or into the garden. From this time, to the 'turn of the disease, he gives milk gruel, *ad libitum*.

"On the day following the first appearance of the opaque spot on the pustules, to grown people he gives an ounce of Glauber's purging salt. To children he gives a dose of it proportioned to their age. Then, if the eruption be small, he allows them to eat a little boiled mutton, and toast and butter, and to drink small beer. But in case of a large eruption, he gives them, on the third day after their having taken the first dose, another dose of the same salt, and confines them to the diet ordered during the preparation."

Sir George, after representing this as the practice of Mr. D. Sutton, ascribes its superior success to the free use of cold air. Dr. Glass, of Exeter, in a publication which appeared shortly after that of the preceding gentleman, imputed the advantages of the Suttonian method to the patient being sweated; while another author, Mr. Chandler, differed from both the former writers, and referred the chief benefit of the plan to the infecting humour being taken in a crude state, "before it has been ultimately variolated by the succeeding fever." Baron Dimsdale likewise thought, that although the whole process might have some share in the production of the success, yet he believed the chief good was owing to the method of inoculating with recent fluid matter, and the management of the patients at the time of the eruption.

In November, 1766, baron Dimsdale published his well known work, entitled "The present Method of inoculating for the Small-pox." The instructions contained in this book have deservedly continued ever since, almost without exception, to regulate the practice of inoculation.

The baron, when the age is left to his choice, avoids inoculating children under two years of age. The subjects considered by him improper for the operation, are such as labour under any acute or critical diseases, or their effects; and also such as have evident marks of corrosive acrimonious humours, or manifest debility.

As for the most eligible season of the year, he thought, that persons generally had more pustules in the spring than any other time; and epidemic diseases (especially Ruxes,

intermittents, and ulcerated sore throats) being most frequent in the autumn, the baron did not look upon this as in general the most favourable season. But he was of opinion, that we might safely inoculate at all seasons, provided care were taken to screen the patients as much as possible from heat in summer, and to prevent them from keeping themselves too warm, and too much shut up from the weather in winter. He thought it prudent, however, to avoid inoculation while any peculiar epidemic diseases were prevalent. He recommended a preparatory regimen, so as to reduce the patient, if in high health, to a low and more secure state; to strengthen the constitution if too low, to correct what appears vitiated; and to clear the stomach and bowels as much as may be from all crudities and their effects. Young or middle aged persons, enjoying a good state of health, were strictly confined to a milk and vegetable diet for nine days previous to the operation, during which period they were ordered to take the following powder three times at bed-time, and a dose of Glauber's salt each succeeding morning. The powder was composed of eight grains of calomel, the same quantity of compound powder of crabs' claws, and $\frac{1}{4}$ th of a grain of emetic tartar. For women or children the dose was lessened, according to their age and strength. For those who were of a tender delicate constitution, or valetudinarians, he prescribed a milder medicine, and rather of the alterative than the purgative kind; indulging some with light animal food, and in case of lowness, with a glass or two of wine. The baron preferred the following method of inoculating. The patient to be infected being in the same house, and if no objection is made to it, in the same room with one who has the disease, a little variolous matter is taken from the place of infection, if the subject is under inoculation, or a pustule, if in the natural way, on the point of a lancet, so that both sides of the point are moistened. With this lancet an incision is made in that part of the arm where issues are usually placed, deep enough to pass through the scarf-skin, and just to touch the skin itself, and in length as short as possible, not more than one-eighth of an inch. The little wound being then stretched open between the finger and thumb of the operator, the incision is moistened with the matter by gently touching it with the flat side of the infected lancet. The baron generally performed the operation in both arms, and sometimes in two places in one arm, a little distance from each other. Neither plaster nor bandage is to be applied to the inoculated part. The baron preferred using such matter as was taken during the eruptive fever, it being then in his opinion endued with most activity. When the disease was to be communicated from an inoculated person, he took the matter, not from the secondary pustules, but from the place of inoculation. The second day after the operation, if the inoculated part is viewed with a lens, he says, there generally appears a kind of orange-coloured stain about the incision, and the surrounding skin seems to contract. At this time the baron used to prescribe the following medicine to be taken at bed-time: calomel and compound powder of crabs' claws, of each three grains, emetic tartar $\frac{1}{16}$ th of a grain. On the fourth or fifth day a hardness is perceptible to the finger. The part itches and appears slightly inflamed. He remarks, that a little clear fluid may be seen under a kind of vesication, the part resembling a superficial burn. In general, about the sixth day some pain and stiffness are felt in the arm-pit. This was regarded as a very desirable symptom, as foreboding the near approach of the eruptive symptoms, and the favourable progress of the disease. Sometimes on the seventh, more often on the eighth day, the symptoms of the eruptive fever appear; such as slight

remitting pains in the head and back, succeeded by transient shiverings and alternate heats, which continue in a greater or lesser degree till the eruption is perfected.

The inflammation in the arm at this time spreads fast, and upon viewing the incision with a good glass, it appears for the most part surrounded with an infinite number of small pustules, which increase in size and extent as the disease advances. On the tenth or eleventh day a circular or oval efflorescence is usually discovered surrounding the incision, and extending sometimes nearly half round the arm, but more frequently to about the size of a shilling, and, being under the cuticle, is smooth and not painful. This efflorescence was also regarded as favourable; it accompanies the eruption, every disagreeable symptom ceases, and the pain and stiffness in the axilla go off.

When the eruptive symptoms came on with more severity, baron Dimsdale used to direct a repetition of the last-mentioned powder, and on the following morning three or four stools were procured by a laxative draught.

The baron notices that sometimes the state of the incision is such for several days, that the effects of the inoculation can barely be perceived, the colour about the wound remaining pale instead of changing to red; the edges of the incision spread but little, they remain flat, and are attended neither with itching nor uneasiness of any kind. Nay, sometimes on the fifth, and even on the sixth day, the alteration is so little, as to make it doubtful whether the infection has taken place. Dimsdale sets down such appearances as unfavourable, and implying a late and more untoward disease. To prevent this, he used to direct the powder or pill to be taken each night, and in case it failed to operate by stool, or there was the least disposition to costiveness, an ounce of Glauber's saue, or a laxative draught, was given in the morning, once or twice, as the case might require. The baron believed that these measures forwarded the inflammation, which he always wished to see, as he had constantly observed, that an early progress on the arm, and an early commencement of the eruptive complaints, portended that the distemper would be mild and favourable; and on the contrary, that when both were late, the symptoms proved more irregular and untoward. The patient, instead of being confined to his bed or room, when the symptoms of the eruptive fever came on, was directed, as soon as the purging medicine had operated, to keep abroad in the open air, be it ever so cold, as much as he could bear, and to drink cold water, if thirsty, always taking care not to stand still while abroad, but to walk about with moderation.

In certain cases, notwithstanding baron Dimsdale found the eruptive symptoms extremely violent, and the patients almost incapable of motion, and apprehensive of cold as the greatest evil, yet he persuaded them to rise out of bed and go out of doors, often supported by assistants, and he allowed them to drink as much cold water as they chose. No sinister accident was the consequence, but, on the contrary, the patients' spirits were revived, and every symptom seemed benefited by the method.

When any uncommon languor happened, a basin of thin broth, or a glass of wine, was allowed in the day, or some white-wine whey at bed-time. Indeed, such things were allowed at any time to tender, aged, or weakly persons. After the eruption was completed, if occasion required, they were indulged in a little well-boiled meat of the lightest kind, as chicken, veal, or mutton.

The practice of baron Dimsdale was certainly, in a great measure, an imitation of the method pursued by Mr. D. Sutton.

We shall conclude this article with a few necessary instructions and references.

1. The age of the person to be inoculated for the small-pox should be as little advanced as possible; but (if it can be avoided) not less than four months.

2. The matter, when convenient, should be taken from a young subject who has the small-pox in a favourable way, and fresh matter should have the preference to such as is old. It deserves particular attention, however, that it is chiefly for the sake of avoiding unprofessional blame that we choose matter from patients labouring under the disease mildly, since experience rather proves, that the lenity or malignity of the small-pox depends very little on whether the matter is taken from one patient who has the distemper favourably, or from another who has it severely. Nor can we wonder at this fact, since the contagion can only be of one sort. Therefore, were a patient much exposed to the casual small-pox, and no matter could be procured from any subject that had the distemper mildly, the surgeon should recommend inoculation with such matter as it would be in his power to obtain.

3. In inoculating, the operator is to make the slightest puncture, or scratch, imaginable in the arm over the place where the insertion of the deltoid muscle terminates. That part of the lancet which is besmeared with the matter, is to be repeatedly rubbed over the wound, and left the matter be wiped away, it is best not to pull down the shirt-sleeve till the part is quite dry. Some operators prefer introducing the lancet, armed with the matter, obliquely beneath the cuticle. When this mode is followed, it is proper at the time of withdrawing the lancet to press the wound with the finger, so that the parts in contact with the matter may wipe it off the lancet with more certainty.

The works on the inoculation for the small-pox are too numerous to be even mentioned: we would, however, particularly refer to Friend's History of Medicine. D'Entrecolle's Lettres Edifiantes et Curieuses. Avicennæ Opera. Mémoires sur l'Inoculation par M. de la Coudaninie. Philosophical Transactions for 1722. Monro on Inoculation in Scotland. Holwell's Account of the Manner of inoculating in the East Indies. Maitland's Account of inoculating the Small-pox. Mead de Variolis et Morbillis. Kirkpatrick's Analysis of Inoculation. Some's Small-pox impartially considered, &c. Murray's Hist. Infectionis Variolarum in Suecia. Dimsdale's present Method of inoculating for the Small-pox. Jurin's Account of the Success of inoculating the Small-pox in 1721, &c. and his letter to Dr. Cotesworth. Woodville's History of the Small-pox, &c.

For an account of the inoculation for the cow-pox, now so deservedly preferred to the preceding practice, see COW-POX and VACCINATION.

A particular description of the SMALL-POX will be found under that word.

INOCULATION, *Hospital for*. See HOSPITAL.

INOFFICIOUS TESTAMENT, in Law. See TESTAMENT.

INOM BARLEY, in Agriculture, a term applied to such barley as is sown the second crop after the ground has been fallowed, or cleaned from weeds.

INORDINATE PROPORTION, is where three magnitudes being in one rank and three others proportional to them in another, you compare them in a different order.

E. gr. If there be in one rank these three numbers, 2, 3, 9; and in another rank, these other three, 8, 24, 36, which are proportional to the precedent, in a different order; so that 2 be to 3 as 24 to 36, and 3 to 9 as 8 to 24; then casting

ing away the mean terms in each rank, you conclude the first 2 in the first rank to be to the last, 9; as 8, the first of the other rank, to the last, 36.

INORGANIC, in *Natural History*, or unorganized bodies, are mineral substances which are not organized or constructed as animals and vegetables capable of life are; such are also called native fossils, to distinguish them from organic remains or reliquia. Martin's "Outlines," p. 1.

INOSARCION, a name given by the old Greek and Roman authors to a peculiar species of emerald, called also by some the Chalcedonian emerald. The great distinction of this from all the other kinds of this gem, was its not being of the pure, clear, and unvarying colours of the others, but having thick veins in it, which gave peculiar refractions and reflections to the light; and though the stone was in itself wholly green, yet when viewed in side lights, these veins gave all those changeable colours that ornament the feathers of a peacock's tail, or the neck of a pigeon.

INOSCULATION. See **ANASTOMASIS** and **ARTERY**.

INOWLOCZ, in *Geography*, a town of the duchy of Warfaw; 56 miles S.E. of Lenciez.

INOWLOCZAW, or **JUNGLESZAW**, a town of the duchy of Warfaw; 26 miles W. of Wladislaw.

INOWSAL, a small island near the northern coast of the island of Borneo. N. lat. 6 45'. E. long. 117° 27'.

IN PACE, a Latin term, used among monks, to signify a prison, where such of them are shut up as have committed any grievous fault.

Formerly there used to be a great deal of ceremony at the putting a religious *in pace*; but now it is not much regarded. Such as are shut up in perpetual imprisonment, are also said to be *in pace*.

Sometimes, also, the words *requiescat in pace* are used by way of allusion to a custom in the Romish church, or praying that the soul of the defunct may rest in peace.

The same words are also frequently seen at the bottom of epitaphs, in lieu of those used by the ancient Romans, S. T. T. L. i. e. "Sit tibi terra levis, Light lie the earth;" or, "Sit humus cineri non onerosa tuo."

IN PALE. See **PALE**.

INPROMPTU, or **IMPROMPTU**, a Latin word frequently used among the French, and sometimes in English, to signify a piece made off-hand, or extempore, without any previous meditation, by the mere force and vivacity of imagination.

INQUEST, or **ENQUEST**. See **ENQUEST**, **ARREST**, **JURY**.

INQUEST of Office. See **OFFICE**.

INQUIRENDO, an authority given a person or persons, to inquire into something for the king's advantage.

INQUIRENDO Idiota. See **IDIOTA**.

INQUIRENDUM, **Ad**. See **Ad INQUIRENDUM**.

INQUIRENDUM, *Melius*. See **MELIUS**, &c.

INQUISITIO Post Mortem. See *Inquest of Office*.

INQUISITION, in the *Civil* and *Canon Law*, a manner of proceeding for the discovery of some crime by the sole office of the judge, in the way of search or examination.

INQUISITION is also used, in *Common Law*, for a like process in the king's behalf, for discovery of lands, profits, and the like. In which sense it is also confounded with *Office*; which see.

INQUISITION, or the *Holy Office*, denotes an ecclesiastical jurisdiction established in Spain, Portugal, Italy, &c. for the trial and examination of such persons as are suspected to

entertain any religious opinions contrary to those professed in the church of Rome.

It is called inquisition, because the judges by their office take cognizance of crimes on common report, without any legal evidence, except what they themselves are able to explore.

Some people fancy they see the original of the inquisition, in a constitution made by pope Lucius, at the council of Verona, in 1184, where he orders the bishops to get information, either by themselves, or by their commissaries, of all such persons as were suspected of heresy; and distinguishes the several degrees of suspected, convicted, penitent, relapsed, &c. However this be, it is generally allowed, that pope Innocent III. laid the first foundation of the Holy Office; and that the Vaudois, and Albigenes were the first objects of it. That pontiff, in the beginning of the thirteenth century, sent Rainier, a Cistercian monk, and Pierre de Castelnau, archdeacon of Maguelonne, to the country of Thoulouse, or Narbonne Gaul, in order to blow up a spirit of zeal and persecution against the prelates and princes. These missionaries were soon followed by others, among whom was the famous Spaniard, Dominic, founder of the order of Preachers, who returning from Rome in the year 1206, fell in with these delegates, embarked in their cause, and laboured, both by his exhortations and conduct, in the extirpation of heresy. These spiritual champions were to give an account to the pope of the number of heretics in those parts, and of the behaviour of the princes and persons in authority to them; and thence they acquired the name of inquisitors: but these original inquisitors had not any court, or any authority, they were only a kind of spiritual spies, who were to make report of their discoveries to the pope, and to excite the Catholic princes and people to extirpate heretics.

It has been generally said, that the tribunal of the inquisition was the invention of St. Dominic, and first erected by him in the city of Thoulouse; that, consequently, he was the first inquisitor; and that, although the year of its institution is uncertain, it was undoubtedly confirmed, in a solemn manner, by Innocent III. in the council of the Lateran, in the year 1215. See Limborch's Hist. of the Inquisition, by Chandler, book i. chap. 10.

This account is contested by Mosheim, who maintains, that St. Dominic was not appointed by the Roman pontiff to proceed judicially against heretics, and such as were suspected of heresy, to pronounce sentence according to their respective cases, and to deliver over to the secular arm such as persisted obstinately in their errors, and therefore, in this sense, was no inquisitor; though, according to the original meaning of the term, he was invested with the commission and authority of the Roman pontiff to extirpate heresy, and oppose its abettors, but without any judicial power: nay, it is farther urged, that the court of inquisition was not erected during the life of St. Dominic. The horrid war, which was excited by Innocent III. against the Albigenes in Narbonne Gaul, and which was carried on by the cross-bearers with the utmost cruelty from the year 1209 to 1229, when a treaty of peace took place between Raymond VIII. earl of Thoulouse, and Lewis VIII. king of France, which gave a mortal blow to the cause of heresy, prepared the way for the full establishment of the inquisition.

Inquisitors of the first kind had, in the course of this time, been placed in almost every city, whose inhabitants had the misfortune to be suspected of heresy, notwithstanding the reluctance which the people manifested to this new institution, and the violence with which they frequently expelled and

sometimes massacred these bloody officers of the popish hierarchy. At length, the council held at Thoulouse, in the year 1229, by Romanus, cardinal of St. Angelo, and pope's legate, went still farther, and erected in every city a council of inquisitors, consisting of one priest, and three laymen. This institution was, however, superseded in the year 1233, by Gregory IX. who entrusted the Dominicans, or Preaching Friars, with the important commission of discovering and bringing to judgment the heretics that were lurking in France; and in a formal epistle discharged the bishops of that painful office. Immediately after this, the bishop of Tournay, who was the pope's legate in France, began to execute this new resolution, by appointing Pierre Cellan and Guillaume Arnaud, inquisitors of heretical pravity at Thoulouse; and afterwards proceeded in every city where the Dominicans had a convent, to constitute officers of the same kind chosen from among the monks of that order. From this period we are to date the commencement of the dreadful tribunal of the inquisition, which in this and the following ages subdued such a prodigious multitude of heretics, part of whom were converted to the church by terror, and the rest committed to the flames without mercy. For the Dominicans erected first at Thoulouse, and afterwards at Carcassone, and other places, a tremendous court, before which were summoned not only heretics, and persons suspected of heresy; but likewise all who were accused of magic, forcery, Judaism, witchcraft, and other crimes of that kind. This tribunal, in process of time, was erected in the other countries of Europe, though not every where with the same success. The method of proceeding in this court of inquisition was at first simple, and almost in every respect similar to that which was observed in the ordinary courts of justice. But the Dominicans modelled it after that of the tribunal, called in the Roman church the tribunal of peace; and hence arose that strange system of inquisitorial law, which in many respects is so contrary to the common feelings of humanity, and the plainest dictates of equity and justice. And that nothing might be wanting to render the spiritual court formidable and tremendous, the Roman pontiffs persuaded the European princes, particularly the emperor Frederic II. and Lewis IX. king of France, not only to enact the most barbarous laws against heretics, and to commit to the flames those who were pronounced such by the inquisitors, but also to maintain the inquisitors in their office, and grant them their protection in the most open and solemn manner. The edicts issued to this purpose by Frederic II. are well known; edicts every way proper to excite horror, and which rendered the most illustrious piety and virtue incapable of saving from the most cruel death such as had the misfortune to be disagreeable to the inquisitors. The laws of Frederic, in relation to the inquisitors, may be seen in Limborch's History of the Inquisition, book i. chap. 12.

The edict of St. Lewis, in favour of these ghostly judges, issued out in the year 1229, is generally known under the title of *Cupientes*.

After the death of Frederic, who had long before repented the power he had given the churchmen, as having seen some of the fruits of it, pope Innocent IV. erected a perpetual tribunal of inquisitors, and deprived the bishops and secular judges of the little power the emperor Frederic had left them. And this jurisdiction, which depended immediately upon himself, he took care to introduce into most of the states of Europe. In 1251 it was established in Italy; in 1255 Alexander IV. appointed inquisitors in France, at the request of St. Lewis. But the inquisitors were so fiery hot, and made such horrible butchery among the reputed

heretics, that they raised an universal detestation even in some Catholic countries themselves. Hence it was that their reign proved very short both in France and Germany; though they were occasionally exerting themselves; and their power was established in many parts of France and Germany about the time of the Reformation by Luther; but afterwards gradually declined. Nor was even Spain entirely subject to them till the time of Ferdinand and Isabella, when their power was increased, under pretence of clearing the country of Judaism and Mahometanism.

The inquisition was first introduced into Spain in the year 1478; but the first inquisitor-general, and the supreme council of the inquisition, were not fixed till the year 1483. This tribunal is arisen to such a height in Spain that the king of Castile before his coronation subjects himself and all his dominions, by a special oath, to the most holy tribunal of the inquisition. It is under the direction of an inquisitor-general, appointed by the king, and confirmed by the pope; and this inquisition has power to name particular inquisitors in every place where there is any tribunal of the inquisition.

The inquisition was established in Portugal, at the pressing solicitation of king John III. about the year 1536: and both the Spaniards and Portuguese have established it in their territories in the western continent.

The power of the inquisition was very much limited in some countries, particularly at Venice, where it was introduced about the year 1289, and where it was received under such modifications, as proved a great check on its authority; the office consisting of secular and ecclesiastical persons, though the latter had been long endeavouring to bring it into their own hands, but could never prevail with the Venetian senate to agree to it. Indeed at Venice it seemed rather a political than a religious contrivance; and served rather for the security of the state, than that of the church. There are appeals from the subaltern inquisitions in Italy, to the congregation of the holy office residing at Rome.

The congregation was first formed by Paul III. in 1542, but finally established by Sixtus V. in 1588. The members of it, called supreme inquisitors, assemble thrice in the week, and every Thursday in the presence of the pope, who presides in it.

The officers or ministers of the inquisition are the inquisitors, who derive their power from the pope, either by word of mouth, or by his apostolic letters, and can be removed only by him, or by authority conferred by him on those cardinals who are the inquisitors-general; vicars-general, who manage the affairs of the inquisition during the absence of the inquisitors; assessors and counsellors, who give their advice in points of theology and law; the promoter fiscal, whose office it is to examine the depositions of the witnesses, to give information of criminals to the inquisitors, and to demand their apprehension and imprisonment, and, finally, when apprehended and admonished, to accuse them; notaries or registers, who write down the injunctions, accusations, and all the pleadings of the causes; the judge and receiver of the confiscated effects; the executor and officials, who apprehend and keep in custody criminals; the attendants or familiars; the cross-bearers; and the visitors, who visit all the provinces of the inquisitors, and report to the inquisitor-general and council whatever was proper to be amended. The civil magistrate is entirely excluded from the cognizance of heresy; but the inquisitors require their assistance for the punishment of heretics, in consequence of the sentence which they pronounce; and they are severely threatened with the most grievous punishments, if they neglect their duty. The punishments inflicted by the inquisition on heretics are eccle-

fiastical and civil: the ecclesiastical or canonical are excommunication, deprivation of ecclesiastical burial, dignities, benefices, and offices. The civil are confiscation of goods, which is inflicted on all who are convicted of heresy, or confess, whether they repent or persist in their heresy, because they are declared to incur the punishment, *ipso jure*, as soon as they fall into heresy; disinheriting the children, inasmuch that though they are Catholics, they can never inherit the estates of their fathers who died in heresy; infamy, which excludes from all public offices, from bearing witness, making wills, &c. loss of all dominion, natural or civil, as power of parents over children, masters over servants, magistrates and princes over subjects, &c. and the deprivation of all property in every thing they have; imprisonment; bann, which is a kind of sentence of excommunication, by which any person is cast out of the commonwealth, so that he cannot enjoy the public protection, or discharge any public offices, or receive any benefit of law; diffidation, which declares heretics to be enemies of their own country and of the empire, so that any person, by his own private authority, may seize, plunder, and kill him, as an enemy and robber, even though he be a clergyman; nor is it lawful for any one to undertake their defence when apprehended; and those advocates who favour and plead for them, are pronounced infamous, and suspended from their office; and finally death, which is that of being burnt alive, in some cases heightened by being gagged with an iron instrument, so that in the midst of their torments they can utter only an inarticulate sound.

It is the constant practice of the inquisition to affect, in all their procedures, to inspire as much terror and amazement as possible; every thing is done with the profoundest silence and secrecy, and with the greatest rigour and pretended impartiality. When a person is seized, all the world abandons him; not the nearest friend dares to speak a word in his defence; that alone would be enough to render them suspected of heresy, and would bring them within the claws of the inquisition; nay, the nearest relations are bribed and constrained to accuse one another. The criminals are seized, examined, tried, tortured, and, unless they recant, are even condemned and executed, without ever seeing or knowing their accusers; whence the revengeful have a fair occasion of wreaking their malice on their enemies. By the forms of the inquisition, a person defamed only for heresy is obliged to make a canonical purgation, *i. e.* to purge himself with seven, more or less, compurgators; so that if he fails in one, two, or three, he is accounted guilty: besides, every one, though excluded by other courts, is admitted as a witness, a mortal enemy only excepted. The names of the witnesses are not shewn to the prisoner; nor is any circumstance discovered, by which he can obtain the knowledge of them. If two unexceptionable witnesses testify of different facts; yea, sometimes if there be only one, or a mere report, it is thought sufficient for ordering the torture; the evidence of two unexceptionable witnesses, who agree, is sufficient for the conviction and condemnation of any person. Those that are informed against are constrained to become their own accusers; and various arts are used to extort a confession from them. The advocate allowed them is under the direction of the inquisition, and employed chiefly in order to betray them: moreover, when the crimes cannot be proved against them, they are only absolved from prosecution, but their crimes and names are recorded against them. The use of torture for discovering secret crimes lying concealed in the mind, is a flagrant instance of injustice; and persons are put to the torture upon half full proof of the crime, *i. e.* faulting, defamation, one witness of his own

knowledge, or when the tokens are vehement, or violent. These tortures are used under a pretence of discovering the truth, and they are varied and continued with the most wanton cruelty. After these, and many other shocking processes, when the inquisition has done with the criminals, and condemned them to death, they are turned over to the secular arm, with much prayer, and pious intreaty, that their lives may not be touched.

Time is no manner of security in point of heresy; nor, does the grave itself shelter the accused from the pursuits of the inquisition; even the deceased have their trials, and they proceed in all their form and solemnity against the dead carcasses. The executions are always deferred till the number of the condemned is very great, that the multitude of sufferers may strike the deeper horror, and make the scene more terrible and shocking. See *ACT of Faith*.

The inquisition is very severe in the Indies. It is true, there must be the oaths of seven witnesses to condemn a man; but the deposition of slaves or children are taken. The person is tortured till he condemns himself; for his accusers are never brought to confront him. Persons are accused for the slenderest expression against the church; or even for a disrespectful word of the inquisition.

The standard of the inquisition in Spain is a piece of red damask, on which is painted a cross, with an olive-branch on one side, and a sword on the other; with these words of the psalm, *Exurge, Domine, & judica causam meam*.

The standard of the inquisition in Portugal hath their supposed founder Dominic's picture on one side, and on the other side the cross, between an olive-tree and a sword, with this motto, *Justitia & misericordia*.

See on the subject of this article Limborch's Hist. of the Inquisition, by Chandler, passim. Mosheim's Eccl. Hist. vol. iii. p. 113, &c. 8vo.

INQUISITORS, in *Law*, are sheriffs, coroners *super visum corporis*, or the like, who have authority to enquire into certain cases, *ex officio*.

IN QUO, *Medium in quo*. See MEDIUM.

INROLLMENT, the registering, recording, or entering of any lawful act, or instrument, in the records of chancery; as a recognizance acknowledged, or a statute, or a fine levied.

Inrollments are also made in the rolls of the exchequer, king's bench; and common pleas; in the hustings at Guildhall, London; and by the clerk of the peace in any county. See REGISTER.

INROLLMENTS, *Clerk of the*. See CLERK.

INSAG, in *Ornithology*, a name given by the people of the Philippine islands to one of the several species of parrots, common in their woods. The insag is a very beautiful bird; its body is of a very bright green, and its head of a fine florid red.

INSANITY. See MENTAL Derangement, MANIA, and MELANCHOLY.

INSANUM PARLIAMENTUM. See PARLIAMENTUM.

INSCHI, or INSCHIKNA, in the *Materia Medica*, a name given by some authors to the common ginger.

INSCONCED, in the *Military Art*, denotes that part of an army that have fortified themselves with a *sconce*, or small fort, in order to defend some pass, &c. See SCONCE.

INSCRIBED, in *Geometry*. A figure is said to be inscribed in another, when all the angles of the figure inscribed touch either the angles, sides, or planes of the other.

INSCRIBED *Hyperbola*, is such an one as lies entirely within the angle of its asymptotes; as the conical hyperbola doth. See HYPERBOLA and CIRCUMSCRIBING.

INSCRIP-

INSCRIPTION, a title, or writing affixed to any thing, to give some farther knowledge thereof; or to transmit some important truth to posterity.

Antiquaries are very curious in examining ancient inscriptions found on stones, and other monuments of antiquity. Sanchoniathon, contemporary, as it is said, with Gideon, drew most of the memoirs whereof his history is composed from inscriptions which he found in temples, and on columns, both among the heathens and the Hebrews.

It appears, indeed, that the ancients engraved upon pillars the principles of sciences, as well as the history of the world. Those mentioned by Herodotus shew, that this was the first way of instructing people, and of transmitting histories, and sciences, to posterity. This is confirmed by Plato in his *Hippias*, wherein he says, that Pisistratus engraved, on stone pillars, precepts useful for husbandmen. Pliny assures us, that the first public monuments were made of plates of lead; and that the treaties of confederacy concluded between the Romans and the Jews were written upon plates of brass; that, says he, the Jews might have something to put them in mind of the peace and confederacy concluded with the Romans. The Greeks and Romans were much addicted to inscriptions, and were extremely fond of being mentioned in them: and hence it is that we find so many in those countries of ancient learning, that large volumes have been composed; as the collection of Gruter, &c.

Since Gruter's collection, Th. Reinesius has compiled another huge volume of inscriptions. M. Fabretty published another volume at Rome in 1669, wherein he has corrected abundance of errors which had escaped Gruter, Reinesius, and other antiquaries, &c. and added a great number of inscriptions omitted by them. Since all these, Grævius has published a complete collection of inscriptions, in three volumes folio.

INSCRIPTION, *Academy of*. See **ACADEMY**.

INSCRIPTIONS, *Notes, or Abbreviations, used in*. See **CHARACTER**.

INSCRUTABLE, **UNSEARCHABLE**, in *Theology*, is usually understood of the secrets of Providence, and the judgments of God, which cannot be found out, or into which human reason cannot penetrate.

INSE, in *Geography*, a town of Prussia; 22 miles W. of Tilit.

INSECTS. See **ENTOMOLOGY**.

INSECTS, *Anatomy of*. Many parts of this subject have been already considered in the article **ENTOMOLOGY**, to which we refer the reader: our present object is to supply what has not been inserted there.

Organs of Motion.—A striking difference is observed in the position of the hard parts, which constitute the essential organs of motion, between this class and the mammalia, birds, &c. In the latter, the bones are placed in the centre of the limbs, and are surrounded by the muscles, which are covered externally by the skin; while in the former, the resisting matters, which are analogous to bones and perform their functions, are hollow, placed externally, supply the place of skin, and contain the moving powers in their cavities.

The structure and appearances of the external coverings vary considerably in the different orders of this class. In the crab, lobster, &c. a hard calcareous crust covers the whole body and limbs, serving for skin and skeleton. In the perfect insects the surface of the body is covered by horny substances of various degrees of hardness and resistance. The larvae have coverings of a softer kind, and approaching more nearly, as far as external characters go, to the skin of mam-

malia and of the neighbouring classes. Yet this is analogous in its functions to the calcareous and horny crusts; for it receives the insertion of the muscles, and therefore constitutes the chief agent of locomotion.

The sensible characters of the calcareous crust of the crab and lobster (their *shell* as it is commonly called) resemble those of the shells of testaceous animals, and in some degree those of bone: but the chemical constitution is in some respects different. The very valuable researches of Mr. Hatchett have made us acquainted with the chief circumstances of the composition of these matters. After having detailed his experiments on shells and on the coverings of the echini, he proceeds: "It was now requisite to ascertain if phosphate of lime is a component part of the substance which covers the crustaceous marine or aquatic animals, such as the crab, lobster, prawn, and cray-fish. Pieces of this substance, taken from various parts of those animals, were at different times immersed in acetous and diluted nitric acid; those which had been placed in the diluted nitric acid produced a moderate effervescence, and in a short time were found to be soft and elastic, of a yellowish-white colour, and like a cartilage, which retained the original figure. The same effects were produced by acetous acid, but in a less degree; in the latter case also the colouring matter remained, and was soluble in alcohol. All the solutions, both acetous and nitric, afforded carbonate and phosphate of lime, though the former in a larger proportion. There is reason to conclude, therefore, that phosphate of lime, mingled with the carbonate, is a chemical characteristic, which distinguishes the crustaceous from the testaceous substances; and that the principal difference in the qualities of each, when complete, is caused by the proportion of the hardening substances, relative to the gluten, by which they are cemented; or by the abundance and consistency of the gelatinous, membranaceous, or cartilaginous substance, in and on which the carbonate of lime, or the mixture of the carbonate and phosphate, has been secreted and deposited. And as the presence of phosphate of lime, mingled with carbonate, appears to be a chemical character of crustaceous marine animals, there is every reason to conclude that Linnæus did right not to place the echini among the testaceous ones. The presence of phosphate of lime, in the substance which covers the crustaceous marine animals, appears to denote an approximation to the nature of bone, which, not only by the experiments of Mr. Gahn, but by the united testimony of all chemists, has been proved principally to consist, as far as the ossifying substance is concerned, of phosphate of lime." *Philos. Transf.* 1799. In a recapitulation of these researches, in the *Transactions* for 1800, he says, "it was proved, that the crust which covers certain marine animals, such as crabs, lobsters, cray-fish, and prawns, consists of a strong cartilage, hardened by a mixture of carbonate and phosphate of lime; and that thus these crustaceous bodies occupy a middle place between shell and bone, though they incline principally to the nature of shell." Similar results to these were obtained by Merat-Guillot, who has described his investigation in the *Annales de Chimie*, t. 34. From 100 parts of lobster crust, he obtained 60 of carbonate of lime, 14 of phosphate, and 26 of animal matter. In 100 parts of cray-fish crust there were 60 of carbonate, 12 of phosphate, and 26 of animal matter. So far as the horny coverings of insects have been examined, they correspond in chemical properties to horn, hoof, scales of serpents, feathers, &c. and do not owe their firmness to calcareous matter, which seems not to be an essential part in their formation. See **HORN**.

An interesting enquiry arises here, concerning the mode of

of formation of these coverings; but our data are hardly sufficient to resolve it satisfactorily. "Some observations," says Cuvier, "seem to prove that there are testaceous animals, which lose their shells entirely at certain periods, and are supplied with new ones. But this reproduction might be effected by development like that of the antler: and if it be also a development, which produces the interior layers of those shells, which do not drop off, it may be compared to that which forms the inner lamina of the horns of cows, sheep, and other ruminating mammalia, and also to the production of the epidermis in all animals: that is to say, it is a desiccation, a kind of death of a membrane, which appeared to have some sort of organization, as long as it was protected from the contact of the external air, or had not acquired completely its characteristic solidity. All the hard parts which hold the place of bones in invertebral animals seem to be developed in this manner. In the crab and lobster, for example, that which serves at the same time for integuments and skeleton, grows no more when it has once attained its perfect hardness; yet the soft parts still continue the progress of their development. When they are too much confined by the hard covering, that separates and is detached: but another is found under it, which was in a state of formation while the former was detaching itself, or, as we may say, dying. This new covering is at first soft, sensible, and even vascular; but a quantity of calcareous matter, previously collected in the stomach, is very soon conveyed to it, hardens it, obstructs the pores and vessels, and renders it, in short, perfectly similar to that of which it has supplied the place. Insects do not acquire their perfect hardness until they have taken their last form, and have no further change of skin to undergo; but all the skins which they had cast off before, although softer, were dead, and already replaced by others, developed before they were discharged. Thus all the hard external organs of white-blooded animals, whatever their consistence and chemical nature may be, should rather be compared, in their mode of growth, to the epidermis, to hollow nails, and horns, than to true bones." *Leçons d'Anatomie comparée*, t. 1, p. 118.

Epidermis.—Crustacea and insects, whether in their larva or perfect state, have a true epidermis; but, as this integument, when it has once become dry and hard, is no longer susceptible of that extension which is necessary to accommodate the growth of the animal, it is separated at certain periods, which are definite in each species, but influenced considerably by the atmospheric temperature: the animal quits its skin, passing out from it as from a sheath. This process is called moulting: the insect, in many cases, is several days preparing for it, and sometimes perishes. Most of the larvæ of the papilio and bombyx kinds change their covering seven times before they pass into the state of chrysalis. The bombyx caca has ten successive coverings.

This most singular process is not analogous to the mere separation of the cuticle in the human subject; for the parts which are detached in insects, in many cases afford attachment to the muscles of the animal. Thus, in the crustacea the whole skeleton is shed, and this takes place annually. "These frequent moultings," says Lyonet, "of the caterpillar of the phalæna cossus are the more singular, inasmuch as the caterpillar does not simply change its skin, but casts its whole external covering, in which we observe the head, jaws, cornæ, all the scaly parts composing the lips, the cirri, the spinning hole, the antennæ, and even the scales enclosed within the head, and affording attachment to several muscles; also the stigmata, the nails, scales, and hooks of the feet, the hairs, the anus, in short all the visible external

surface of the animal. In disposing itself for this operation, it passes some days without taking any nourishment; the muscles, and other interior organs of the head, are detached from the old cranium, and withdrawn into the neck; they form a new covering, similar to that which they have left, but larger, and at first soft. When the new skin, and all the other parts, which contribute to the covering of the caterpillar, are formed, the old one is opened, and the animal withdraws from it by an operation so much the more difficult in consequence of the weakness caused by the soft state of the new organs, which will not allow it to act with vigour, nor to take any nourishment for some days.

"The caterpillar, thus newly clothed, exhibits different proportions from those which it had before moulting; the head, legs, and all the horny parts are sensibly larger in comparison to the rest of the body; these therefore do not increase afterwards. The body and soft parts of the animal only grow, until they become again too large for their covering, and a new moulting is necessary." Lyonet, *Traité Anatomique de la Chenille*, p. 7.

Rete Mucosum.—The place of this organ is held in the crustacea, by the calcareous shell, which immediately succeeds the epidermis; its colour is commonly a dull green, sometimes red, blue, white, or black. Alcohol, acids, and particularly the application of heat, often produce remarkable changes in these colours, as we may observe in the lobsters brought to our tables. In larvæ a layer of mucous substance is seen between the epidermis and the muscles; and the colours of this vary infinitely in the different species. It is particularly remarkable for its brilliancy in caterpillars, and the larvæ of some hymenoptera; it gives to their bodies the purest and most lively tints, of which the shades and symmetry are admirable. Red, purple, violet, blue, green, yellow, scarlet, black, &c. are distributed in the most regular and striking manner. Probably the brilliant colours of the perfect insects are owing to the mucous body dried and blended with the horny covering. For whilst the lepidoptera are in their chrysalis state, the small coloured scales which will afterwards adorn their wings, appear like the mucosity which is under the skin of the caterpillars. The colours of the spiders are also owing to this mucous matter, which is found under their skin, and has the appearance of small glandular points marked by different shades of colour. But in the coleoptera, and in several other orders, the colours seem to reside in the horny tissue, as those of the testacea do in their calcareous shells.

Nothing can be seen in this class, which can be compared to the cutis; there is a pellicle under the shell of the crustacea, but it is fine, transparent, and has very little consistence. The layer which is separated from larvæ in their moultings, is of the same nature and thickness as that which is under it and succeeds. The coverings of the contracted chrysalises, such as those of the lepidoptera and diptera, cannot be regarded as a true skin; it is rather a horny epidermis. Lastly, in their perfect state, insects have nothing in their coverings which can be compared to cutis. The hairs of insects seem to be productions of their epidermis; for they are discharged with that in moulting, and are supplied by new and longer ones. The scales of the wings and body in the lepidoptera and some other orders, are small horny plates, differently coloured, implanted in the skin, and placed one over the other, like tiles in the roof of a building. The plumes of some insects are prolongations or shreds of the wings, furnished with long hairs on their sides.

Joints.—The crustacea and the proper insects agree in the kind of their articulations; the particular nature of which arises from their hard parts being placed externally to the muscles,

INSECTS.

mufcles. The former being made like sheaths, and having their cavities filled by the mufcles, cannot be articulated by fimple and plane fufaces; their joints therefore exhibit no fpecimens of arthrodia and enarthrofis. All their moveable articulations may be reduced to three kinds. Where the parts require a folid point of fupport, the ginglymus is employed; the horny coverings of the limbs, being tubular, muft reft on each other in two points of their circumference at leaft, and this arrangement neceffarily determines the ginglymoid form. Where a folid point of fupport is not required, the parts are merely fufpended by ligaments, or are articulated by a kind of fetting in. In the latter conftruction one part enters and is received into the hollow of another. Thus the thighs of infefts are fet in the thorax, and the rings of the abdomen are fet into each other. Since the part which receives, and that which is received, are fegments of a fpheroid, the latter may perform a twifting motion: it may be pushed more or lefs completely into the cavity, either equally in its whole circumference, or to a greater degree on one or the other fide; but flexion properly fo called cannot be performed. The parts which are connected by ginglymus, and which are chiefly the different portions of their legs, have deep notches on that fide where the flexion is moft extenfive; the interval is filled with a pliant membrane, and there is no other ligament. The articular tubercles and excavations are fo arranged that they cannot be luxated without fracture.

Mufcles.—The mufcular fyftem of the cruftacea is confined to the motions of the legs, tail, and falfe feet; there are no mufcles for moving the head on the thorax, fince the two parts are confolidated into one piece in this order. The antennæ, the jaws, and the palpi, have particular mufcles, but we fhall not confider them at prefent. The tail is a very principal part of the body in moft cruftacea. It confifts of a very ftrong and moveable member, which they employ with great effect both in jumping and fwimming. It is compofed in fveral monocoli of long threads, which in the polyphemus (mouluca crab) are folid and moveable at their bafes only. In the crabs it is fhort, flattened, and curved under the body in a depreflion placed between the legs. The cancer bernhardus (hermit crab) has a foft tail without fcales, which it introduces into empty fhells or hollow ftones.

The tail deferves a particular defcription in the lobster, where it is formed of fix chief fegments, and terminated by five plates. The former are not all of exactly the fame figure; they are convex above, and cover one another like tiles; below they are narrower, and united by a loofe membrane which allows them confiderable mobility. In the latter fituation, at the angle of union between their dorsal and lower portions, they have a kind of firm fins, bordered with ciliated proceffes, and formed of fveral articulations. Thefe are called falfe or fwimming legs (*pedes natatorii*). Thefe admit of being moved from before backwards, and a little from without inwards, by means of fmall mufcles contained in their interior, but not differing fufficiently from thofe of the true legs to merit a particular defcription.

The five plates, which terminate the tail, confift of two pairs and a fingle one; the latter is placed in the middle, and articulated directly to the laft fegment. The opening of the anus is found under it. In fome fpecies it is divided in its middle, fo as to admit a flight motion. Each of the lateral pairs is fupported by a common piece articulated to the laft fegment of the tail. The internal plate of each pair is fimple, and ciliated, like the middle one, only at its extremity; but the external is in a manner articulated, or rather formed of two pieces; the firft of thefe covers by its extremity, which is denticulated, the fmall which fucceeds, and of

which the edge is fet with very clofe cilia. The mufcles which move this tail are fo fingular, as to merit a diftinct defcription.

The mufcles of the tail, in the lobster, form two mafles, feparated from each other by the inteftral canal. In the dorsal mafs, which is the thinnelt, and leaft complicated, three kinds of fibres may be obferved. The firft conftitute a mufcle attached to the dorsal portion of the thorax towards its posterior fourth part. It is then directed obliquely backwards and outwards towards the fides of the firft fegment of the tail, in which it is inferted. The portion of one fide acting feparately, will carry the tail towards the right or left; when both act together, they will extend the tail, and maintain it in the extended ftate. The fecond and third feries of mufcular fibres are extended through the whole length of the tail in two parallel and contiguous lines. They arife from the upper and lateral portions of that feptum of the thorax, on which the branchiæ are applied, by fveral digitations. When it has arrived at the firft ring of the tail, a fmall interfection is obferved on the furface, and we obferve that a fmall bundle of fibres turns off to be inferted into this firft annular fegment; and a fimilar infertion takes place in each of the fucceeding rings. This difpofition gives to the internal band the appearance of a twifted cord. The external portion of the dorsal mafs is formed of diftinct longitudinal fibres. Thefe three orders of mufcles have much analogy to the ftraight dorsal mufcles of caterpillars, as we fhall fee in the fequel.

The ventral mafs of the mufcles of the tail is much thicker and more complicated than thofe of the back. In order to give a clear notion of its compofition, we fhall defcribe it as obferved in three afpects. In the firft place, from the back; the mufcles which we have defcribed, as well as the inteftral canal, having been removed; fecondly, from below, the fcales which cover the under furface of the tail, and the nerves having been taken away; and thirdly, on the infide, a longitudinal fection having been carried through the mufcle in its middle line, in order to expofe the internal ftructure.

The ventral mufcle of the tail, on its dorsal afpect, arifes in the interior of the thorax, above the intricate bony texture, containing the mufcles of the legs. It is then divided into a right and left portion; each of which is formed of three broad digitations. Over the firft fegment of the abdomen, its longitudinal fibres dip under others, which turn round and embrace them. The reft of the mufcle, in the whole length of the tail, is thus formed of two feries of convex fibres curved in parallel direftions, placed laterally with regard to each other, and feparated from right to left by a channel in which the inteftral canal is lodged.

On the under furface three very diftinct orders of fibres may be feen. The firft is produced from the inferior furface of the digitations which arife from the bony frame-work of the thorax. The fecond confifts of oblique fibres, which are a continuation of the former, extending from the middle line, in which the nervous cord is placed, to the fides of the rings at the angle of union between their dorsal and ventral portions. Each of thefe angles, from the firft to the fixth, has two ftrong bundles. The third feries is made up of tranfverfe bundles defcribing arcs, of which the convexity is downwards. Thefe mufcular flattened hoops correfpond to the interfections of the rings, and feem to form derivative pulleys for the oblique fibres juft mentioned.

Laftly, the ventral mufcle of the tail, divided longitudinally in its middle, refembles a rope with the ftands rather obliquely difpofed. The fibres belonging to the tranfverfe bundles are diftinct and narrower.

From this fingular complication it results, that the mufcle, when

when insulated from all its adhesions, constitutes a very close twist, the threads of which, instead of acting in the longitudinal direction, move obliquely in the canal which they occupy between the neighbouring fibres.

The legs of the crustacea vary in number and size. Their figures are very different in the monocoli; sometimes they hold the place of palpi, jaws, fins, branchiæ, &c. They differ considerably in form in the crabs, particularly the first pair. We shall describe the legs of the crab and lobster as an example of these organs. They are usually five in number on each side, and each has six articulations. The first pair is considerably the largest, and forms what we call the claws.

The hip, or haunch, is attached to the chest, and moves only from before backwards. It supports one division of the branchiæ, as well as the second piece of the member, which corresponds to the thigh. The latter is flattened, short, nearly square, smooth, and a little curved. The plane of its articulation is parallel to the length of the piece; and as the two muscles which move it are inserted into the two most remote points, the thigh is situated horizontally. It has a hinge-like motion on the hip, combined of the two directions from before backwards and from within outwards. Its motion on the leg, which is very limited, takes place only from below upwards, and produces the approximation of the limb to the chest. The third portion corresponding to the leg is also rather flattened, particularly at its femoral extremity. It is slightly curved in the direction of the thigh, so as to correspond to the convexity of the thorax. Towards the tarsal end it becomes larger and rougher: its motion on the thigh is very limited. The fourth articulation is intermediate between the pincer and the leg, on which it moves in a very distinct angle. The pincer composes the fifth, and by far the largest piece. It is terminated on the outside by a pointed and serrated projection; and it receives on the opposite side a moveable pointed piece or pollex, capable of being opposed to it, which, with the other, constitutes the pincer. The motion of this on the fourth piece is from without inwards. The two following pairs of legs resemble the former on a smaller scale, with this difference, that the two pieces, composing the pincer, are of equal size. The two last pairs of legs differ from the three others in not being terminated by a pincer, but by a single nail. In every other respect they resemble the two preceding pairs.

Muscles of the Legs.—Each articulation has an extensor and a flexor muscle. The extensor of the hip is situated in the interior of the thorax, on the horny piece which supports the branchiæ, rather in front of the hip, which it draws forwards. The flexor arises from the same part farther back, and produces the contrary motion to the preceding.

The extensor of the thigh is stronger than the flexor; it is attached to the inner and front part of the hip, and to the superior eminence of the thigh. It depresses rather than bends. The flexor, or rather the elevator of the thigh, is shorter than the former: it occupies the posterior internal surface of the thigh, and is inserted into the inferior eminence.

The extensor of the leg is placed in the hollow of the thigh, of which it occupies the whole breadth; it is inserted into the external border of the leg. The flexor is less powerful, lies under the extensor, and is fixed to the inner edge.

The extensor of the first piece of the tarsus is attached to the whole upper edge of the leg, and is inserted into the highest eminence of the fourth piece. Its flexor arises

from the lower edge of the leg, and is inserted into the lower eminence.

The extensor and flexor of the pincer occupy and divide the interior of the fourth piece: their functions are determined by their situation. The extensor of the moveable piece or pollex is a very small muscle, occupying the upper part of the pincer: its flexor occupies all the rest of this part, is a very bulky muscle, and has a flattened oblong bony tendon in its middle. From this muscle arises the great power of the animal in seizing and holding objects.

Organs of Motion in the Larvæ of Insects.—As insects undergo considerable changes of form at certain epochs of their life, they exhibit remarkable differences in their organs of motion. Hence it becomes necessary to describe them in their various states. All the winged insects, which undergo a complete metamorphosis, differ very considerably in their first state from that which they have in the sequel; and the most striking of these differences regard the moving powers. At this time they are called larvæ or caterpillars; and they preserve this form for a longer or shorter time after quitting the egg. They are covered with a flaccid and soft skin, divided into segments or rings susceptible of motion on each other, by means of small muscular bands situated in the interior of the body. Frequently their motions are performed simply by crawling on these rings, after the manner of reptiles; or, by resting successively each of the segments of the body on the plane which supports it. Such is the case with the larvæ of the diptera, and of most of the hymenoptera. Sometimes the surface of these rings is furnished with spines, stiff bristles or hooks, in order to give them a firmer hold on bodies: this may be observed in some flies, ættri, tipulæ, &c.

On the under surface of the body in some orders, there are six feet near the head, each of which is formed of three articulations: the last is horny and terminated in a hook. By opposing these to each other the insect can hold any object, hook itself to it, and then draw the rest of the body towards this fixed point. This formation is seen in the coleoptera, and many of the neuroptera. The six feet are very short, and hardly susceptible of any useful application in some other coleoptera, viz. such as live in the interior of wood, as the cerambyces, rhagia (Fab.), &c. The latter move in the hollows which they excavate by means of their jaws, by which they attach themselves, and with the assistance of plates or tubercles, with which their skin is furnished on the back and belly: their mode of proceeding may be compared to that of sweepers in chimnies.

Lastly, the lepidoptera, and some hymenoptera have, besides the six horny articulated feet, a variable number of false feet, not articulated, terminated by hooks disposed in circles and half circles, and attached to the skin on retractile appendices or tubercles: they move by fixing themselves to bodies by means of these organs.

The larvæ of such insects as undergo an incomplete metamorphosis, as the hemiptera, and of such as pass through none at all, as the aptera, except the flea, do not differ from the perfect insect in the feet.

After this general statement of the external organs of motions in the larvæ, we shall particularly describe the muscles of some. We shall first mention those of the proper caterpillars; then those of a scarabæus, which lives underground; of a hydrophilus, which inhabits the water; and of a cerambyx, which is found in the hollows of wood.

1. *Muscles of Caterpillars.*—The deepest stratum of muscles in the caterpillar is formed of four principal rows; two corresponding to the back, and two to the belly: their direction is longitudinal. Those of the back are separated from each

other by the longitudinal vessel, and from those of the belly by the tracheæ. They begin at the union of the first and second rings, by two fasciculi slightly separated from each other, which are inserted into a kind of tendinous line produced by the union of the second with the third ring. The same structure exists in the subsequent rings. On the third, the fibres of the two fasciculi, although still distinct, are much more considerable: on the fourth the internal fasciculus alone has its fibres separate. The muscle is continued, without any apparent interfection, over all the other rings. It diminishes in thickness towards the opposite end of the body, and forms again several fasciculi; at first three, then four, and, lastly, five or six. The body is shortened when these muscles act in conjunction with those of the belly: it is curved upwards when they act alone.

The longitudinal muscles of the belly are separated from each other by the medullary cord, and from those of the back by the tracheæ. Their direction is precisely the same with that of the dorsal muscle. They commence at the union of the two first rings by several fasciculi, which are united into one mass over the third ring. Their fibres are separated again behind, higher or lower according to the species, and form four or five muscular cords, which terminate towards the last pair of false feet. These assist the dorsal muscles in shortening the body when both sets contract together; but they antagonise them, when they act separately, for they then incurvate the body downwards.

Between the long muscles of the back and the skin shorter ones are found, having an oblique direction. Some are extended from without inwards, towards the dorsal line, between the annular interfections. Others occupy the same interval, but have an opposite direction, passing from within outwards, so as to describe with the former the figure of the letter V. These two orders of oblique muscles have not every where the same quantity of fibres. In the first rings they are narrow and long: those of the fourth, fifth, and sixth are much shorter: further back they become much longer and more numerous in some species, while in others they still continue broad and short. These muscles act separately on each ring, which they shorten by their simultaneous contractions; but, as they do not extend over the whole length of the ring, the parts corresponding to the folds, over which the oblique muscles do not pass, are elongated, when, by the action of the latter, the diameter of the ring is diminished: thus progression is facilitated.

Under the long muscles of the belly is found another stratum, of which the fibres are oblique. These very much resemble the oblique muscles of the back; and may be distinguished, according to their directions, into two orders. Those of one set are found nearer to the middle ventral line, in which the knotted nervous cord is found; and ascend from within outwards, in the intervals of the rings. The others are not so oblique, with the exception of the three superior pairs. These muscles, therefore, form, with the preceding, an angle, similar to this kind of A.

The oblique muscles which run from within outwardly, or the most internal, have many fibres. They usually consist of three or four distinct fasciculi. Those which extend from without inwardly, or the most external, have fewer fibres, and never more than two fasciculi.

The action of these muscles appears to be similar to that of the oblique muscles of the back; but it is probable that they also extend immediately the skin of the feet on which they are situated.

Besides the longitudinal and oblique muscles of the back and the belly, caterpillars have some which are lateral; that is to say, muscles situated below and above the stigmata

or apertures, which ought to be described separately. These muscles are of three kinds, the *straight*, the *transverse*, and the *oblique*.

The straight lateral muscles are situated between the annular segments, above the stigmata. They are all placed longitudinally one over the other. Their points of attachment are covered by the transverse muscles. They seem intended to bend the body towards the sides when they act separately; but when they contract, in concert with the long muscles of the back and abdomen, they shorten the body, and thereby assist its progression.

The transverse lateral muscles are of two kinds: some, which are longer than the others, arise from the intervals unoccupied by the attachments of the straight lateral muscles, and are inserted at the termination of the oblique external muscles of the abdomen. Their fibres are disposed somewhat in the form of a fan. The others have the fasciculi formed of parallel fibres; they are shorter, and are extended in each of the rings between the straight, lateral, and oblique muscles of the abdomen. These muscles diminish the diameter of each ring, and consequently lengthen it in each of its folds. This mode of action is necessary for progression.

The oblique lateral muscles are situated on each side of the straight. They proceed in an oblique direction from below upward, under the insertion of the straight lateral muscles, which they assist when they act together.

Such are the muscles of the body in general; but the true and false feet, and the head, have particular muscles, which must be described separately.

The muscles of the true or scaly feet are situated within the three articulations of which these feet are formed. They may be distinguished into those which move the articulations, and those which act on the *unguis*, or claw, that terminates them.

The muscles of the first joint consist of five or six fasciculi, which arise from the superior margin of this articulation, and are inserted into the superior margin of the next. The muscles of the second joint are nearly equal in number, and are inserted into the superior margin of the third.

The muscles of the *unguis* terminate by two tendons: but they are formed of several fasciculi, some of which arise from the second and third joints in two very distinct layers; others from a line which corresponds with the convexity of the *unguis*; and lastly, others from the line which answers to its concavity. These tendons are inserted into two tubercles at the superior extremity of the *unguis*, on the concave side, towards its point. They serve to bend the *unguis*, which probably recovers its position by the elasticity of its articulation.

There are two muscles to each of the membranous or false feet. Their direction, with respect to the body, is almost transverse. They extend from the centre of the feet, into which they are inserted towards the back, and beyond the stigmata, whence they arise by lateral bands more or less oblique. Their use is to draw the centre of the foot inwardly, and to retract the hooks with which the limb is armed. It is probable that the contractions of the oblique muscles of the abdomen produce the opposite effect.

With respect to the muscles of the head, we shall at present describe only those which produce its entire motion. We shall notice the others in treating of the different functions to which they are subservient. The muscles which act on the head, bend it upward, downward, and towards the sides. Those which bend it upward are very numerous. They arise from the second and first ring, and are inserted into different points of the occiput; some near the middle

line, others more laterally. They form, in general, two fasciculi. The most internal is the least bulky. The lateral flexors are very oblique. They arise from the inferior or abdominal part of the body, and extend to the lateral parts of the occiput. The inferior flexors, which bend it downward, appear to be the continuation of the straight muscles of the belly. They consist of eight or nine fasciculi.

2. *Muscles of the Larva of a Scarabæus.*—The larvæ of the scarabæus have the body arched, and convex superiorly, and concave on the side next the feet. The back and the belly are separated by a membranous border, which has folds, and is situated under the stigmata. These larvæ have only six articulated feet, none of which are membranous. On opening these larvæ longitudinally, either on the back or the belly, we observe three layers of deep-seated muscles—the lateral, the dorsal, and the ventral.

The dorsal layer is formed of two tolerably distinct series of fibres. One series is external, and occupies the intervals of the ten first rings; that is to say, those which are furnished with the stigmata. The muscles which compose this series are narrow, and preserve a longitudinal direction. The second series is produced by fibres, which are somewhat oblique, and extended in the same space, but more towards the middle line. These muscles are broader and stronger towards the head, and more narrow and less fibrous towards the tail. They terminate between the tenth and eleventh ring by a very narrow fleshy band. These muscles seem intended to shorten the dorsal portion of each of the rings: this action diminishes the convexity of that part, and thereby serves to assist progression.

Near the middle line, between the ninth and tenth ring, there are two small muscles a little oblique; but between the twelfth and the last ring we observe only one series of small short muscles, which occupy all the convexity described by the curvature. The action of these muscles is obviously the same as that of the preceding, to which they are accessories.

When the first layer of dorsal muscles is removed, we find fibres precisely similar underneath, but running in the opposite direction. Finally we observe, in the dorsal layer, lines of very short muscular fibres above the inferior plane of the ninth and tenth ring. The use of these little muscles is probably the same as that of all the preceding, though their action is less apparent.

The ventral layer very much resembles that of the back. These muscles, like the dorsal, form planes of opposite directions; the most deep-seated proceeding from the internal side, while those which are nearest the skin ascend from the external side. This produces a small but very regular rhomboidal figure in the middle of each ring on the line bisecting the belly. The action of these muscles is the opposite of that of the dorsal layer.

On the last segment, and towards the part that answers to the anus, we observe a bundle of transverse fibres, which, by their contraction, doubtless serve the purpose of a sphincter.

The lateral layer of muscles is composed of three kinds of fibres, which are very distinct with respect to their course. They represent a lace passed through the meshes of a net. All these muscles are situated behind the stigmata, and inserted into the folds which separate the belly from the back on both sides.

Those of the first order are completely transverse. They extend over the union of each ring with the succeeding in the space included between the ventral and dorsal muscles. It is obvious that they must diminish, by their contractions, the

diameter of the body, and consequently extend it longitudinally. These muscles are in general very narrow.

The second set is formed by oblique fibres which ascend from without inwardly towards the middle ventral line, from the union of one inferior ring to the union of the preceding. These muscles are broad and very strong, they serve to form the folds of separation between the back and the belly.

The muscles of the third order are less oblique than the preceding, to which they appear to be accessories. Each of the muscles which compose this division arises from the middle of a ring, and is inserted under the head, where the preceding muscles are inserted, that is to say, on the ventral side.

It should be remarked, that the two last rings have no lateral muscles.

The muscles of the head are very strong, the flexors are attached to the ventral muscles above the union of the second ring with the third. They are formed of three principal fasciculi, which approach each other, and are inserted into the posterior and inferior part of the head, at the base of that scaly piece called, by Latreille, *ganache*. The extensors or levators of the head consist also of three fasciculi, but they are longer and stronger than the former. They have their origin in the side, and penetrate under the transverse and oblique muscles; one is attached to the sixth ring; another to the fifth, and another to the fourth. They are inserted into the posterior lateral parts of the head.

3. *Muscles of the Larva of a Hydrophilus.*—The larvæ of the hydrophilus are elongated. Their body is somewhat flat, and all its rings are distinct. They not only walk very quick, but they even swim with great velocity, in consequence of different inclinations suddenly and successively given to the body.

These larvæ, when opened longitudinally, likewise exhibit four different kinds or divisions of muscles: those of the belly, those of the back, and those of both sides.

The ventral muscles very much resemble those of caterpillars: they are formed of two distinct layers. The deepest, or that which first appears on the belly when examined through an opening on the back, is composed of longitudinal fibres with interseptions which correspond to each ring; the second layer, or that which is next the skin, is entirely covered by the preceding; it is composed of oblique fibres, which cross each other in the form of an X, and which are extended longitudinally in each ring.

The dorsal muscles are long, extending from the head to the tail, and forming on each side two rows of fibres, which appear twisted over each other like ropes. They are broadest towards the head. Their fibres are inserted partly into the inferior border of an anterior ring, and partly into the superior border of the next ring.

These long muscles cover some which are oblique, and cross each other in the form of an X. They extend from the middle part of one ring to the anterior edge of that which succeeds it.

The deep-seated lateral muscles, which are numerous, have a transverse direction. Each ring has three or four, and their course is such, that they resemble the letters N or M lying on one side, thus N M .

Beneath the transverse lateral there are some longitudinal muscles that have a small degree of obliquity: they form a pretty large surface, which is uninterrupted throughout its whole length, and confounded with the oblique muscles of the belly. Their fibres determine the chief motions of the

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body, in the same manner as the long muscles of the back and belly.

The muscles of the feet are the same as in the perfect insect.

The head has no particular muscles. The long muscles of the back, being inserted into the occiput, become extensors. The first transverse lateral pair are inserted beneath the head, and produce the lateral flexion. The long oblique muscles, which terminate at the inferior part of the head, become real flexors.

4. *Muscles of the Larva of a Cerambyx.*—In the larvæ of the cerambices we find the same muscles as in those of the scarabæi; but as the shape of the body differs considerably in these two kinds of larvæ, there results some variation in the form and extent of the muscular organs.

A great part of the head of the larva of the cerambices can be drawn within the skin whenever the animal pleases. Very strong muscles, similar to those we have described in the scarabæus, are appropriated to this function. As the head, which is very large, enters into the body, the extremity which receives it is somewhat thicker than the same part of the scarabæi, and the muscles which move the rings are more extensive than theirs.

The flat fleshy tubercles which we find continued along the back and belly, are a kind of feet, which this larva uses in progression. They move by the alternate contractions of the correspondent muscles: this larva, therefore, moves with equal facility on the back and on the belly.

Of the Organs of Motion in Perfect Insects.—The great variety of motions which insects are capable of performing, entitles them to hold the first rank among the animals that have no vertebræ. We discover, in these minute beings, all the requisites necessary to produce those voluntary actions, the execution of which astonishes us in vertebral animals of far greater magnitude. They even unite several functions which are very seldom found combined in the other classes; for insects walk, run, leap, swim, and fly with as much facility as the mammalia, birds, and fishes exercise one or more of these faculties.

Insects are probably indebted for this advantage to the numerous articulations of which their bodies are formed. We must therefore pay attention to their different articulations, before we proceed to examine the actions they permit or produce.

1. *Of the Head.*—For a description of the manner in which the head is articulated to the thorax, see ENTOMOLOGY, under the division *Caput*, or *Head*.

The muscles which move the head are situated within the thorax. We shall describe here only those most generally met with. The levators or extensors of the head are commonly situated in the superior part of the corselet, and the depressors inferiorly.

Immediately beneath the middle dorsal part of the corselet, we find a pair of muscles which arise from the anterior portion of the scutellum, when that part exists; or from the superior part of the pectus. These muscles are inserted into the posterior and superior part of the head, on the edge of the occipital hole: they draw the head back, and lift it up when it is depressed.

On the lateral parts of this first pair we find another which is more slender: the insertion of this pair likewise takes place at the occipital hole, but more outwardly. They arise obliquely from the lateral parts of the corselet. These muscles turn the head to one side when they act separately; they raise it, and bring the mouth into the middle line when they contract together. It will be easily conceived that

insects which have the head articulated like a knee, these rotatory muscles are much stronger and more conspicuous.

The flexors of the head are also four in number, two on each side. The first pair arises in the internal inferior part of the pectus, from a small horny process, which, in the coleoptera is of a square form, and has the four angles terminated by solid branches. These muscles extend directly to the inferior part of the occipital hole. From their position they doubtless move the head directly backward. The second pair, which are much shorter, arise from the inferior lateral part of the corselet, and proceed to the side of the preceding, with which they concur in their effect when they act together; but when one of the two contracts separately it bends the head to the side.

2. For the description of the *thorax* or *corselet*, of the *pectus* or *breast*, and of the *abdomen* or *belly*, see ENTOMOLOGY, under the respective divisions.

3. *Of the Members.*—For an account of the number and structure of the feet, see ENTOMOLOGY under the division *Members*.

The motion of each joint is performed in a single place. It is provided with two muscles only, which are enveloped in the preceding joint. They are an extensor and a flexor.

In the coleoptera the coxæ move by a kind of rotation on their longitudinal axis, which is situated transversely, and forms, with the middle line of the body, an angle more or less approaching 90°. As the femur is attached to the internal extremity of the coxa, the distance between the thighs is greatest in those insects in which the femur is most bent with respect to the coxa, to which it is articulated. It is obvious, therefore, that the position of the plane in which this flexion is made, depends upon the situation of the coxa: when it is turned forward, the plane is vertical; when turned backward the plane is always more oblique; and in the insects that swim, it is even horizontal. It appears, then, that the almost imperceptible motion of the coxa determines the most remarkable movements of the feet.

The muscles of each pair of coxæ and femora are situated in the superior of the corselet or of the pectus. To obtain a proper view of them, it is necessary to cut the body of the insect in a vertical direction. Over the last pair in the pectus there is a scaly substance, in the form of a Y. The stalk of this part affords an origin to a muscle which turns the coxa backward, and is inserted into its posterior edge. The muscle which turns it forward arises from the back, and is inserted by a thin tendon, into its anterior edge.

The muscle which extends one femur, while it is approximated towards the other, is very considerable. It arises from the whole branch of the piece in the form of a Y, and is inserted into the internal edge of the head of the femur. Its antagonist is situated within the body of the coxa.

The muscles which extend the two pairs of anterior femora, arise from the corresponding dorsal parts, and not from particular internal substances: the flexors, however, are always situated within the body of the coxæ.

The muscles which turn the coxæ arise also from the parietes of the corselet; viz. the muscle which moves it backward, from the dorsal part, and that which moves it forward, from the lateral part. In the water beetles, which, as we have observed, have the posterior coxa consolidated and immovable, these muscles seem to extend to the femur, which is therefore furnished with four, two extensors and two flexors.

The

The other orders of insects have nearly the same conformation as the coleoptera.

The muscles of the tibia are situated within the femur. The extensor, which is short and slender, is attached to its external edge (the femur being supposed extended in the longitudinal direction of the body): the flexor is much stronger and longer. It is situated on the inner side, and in the whole of the superior part.

There are likewise two muscles to each joint of the tarsus: one, which is small, and placed on the superior or dorsal surface, acts as an extensor. The other, which is more conspicuous, and situated on the inferior side, acts as a flexor.

For the description of the wings, see ENTOMOLOGY.

The muscles that move the wings are not yet well ascertained. They appear to be two kinds. Some, which are small and short, are fitted to extend or fold the wings, at the same time that they move them to or from the body: the others, which are somewhat longer, are calculated to produce the motions of elevation and depression which the wings perform.

The elytra of the coleoptera, orthoptera, and hemiptera, do not appear to assist in the action of flying, at least they are not moved in the same manner by the muscles of the pectus.

Organs of Sensation.—On comparing together all the nervous systems, we find only one common part, which is a single tubercle, situated at the anterior extremity of the system, and always producing two lateral transverse fasciculi or crura, which unite it to the rest of the system. This part appears always to correspond to that named cerebellum in man. The cerebellum of animals that have red blood and vertebræ, is always preceded by several pairs of tubercles, forming usually a larger mass than the cerebellum itself, and united to the rest of the system by two longitudinal fasciculi or crura, which are interwoven in crossing with those of the cerebellum. This union takes place in such a manner that both are confounded in the common mass which forms the root of the medulla oblongata, and medulla spinalis, and leaves no space between them. These tubercles make what we call the cerebrum.

In the white-blooded animals, or those that have no vertebræ, there are also tubercles corresponding to the cerebellum, but they are much smaller, removed from each other, and connected with the cerebellum only by separate nervous filaments. The crura of the cerebellum leave a large interval between them, which receives the œsophagus as in a collar.

The two fasciculi, forming the medulla spinalis, are intimately united in vertebral animals, and no trace of their separation remains, except a longitudinal furrow before and behind. But, in the animals which have no vertebræ, when this production exists, it is formed below the œsophagus by the union of the two crura of the cerebellum. These two fasciculi commonly remain distinct throughout the greater part of their length, and are only united at different spaces by knots from which the nerves proceed. This production, however, frequently does not exist. In some animals with white blood, which have no elongation of the medullary substance, as in the mollusca, the nervous trunks, which are derived from the crura of the cerebellum, enlarge and form ganglia, or two or three nerves unite with each other to produce a common ganglion; and in general it is only from their ganglia that the nerves which are distributed throughout the body take their origin.

In those white-blooded animals that have a knotted and double medullary production, that is to say, in the insects, crustacea, and certain worms, the nerves all arise from the

knots or ganglia of the medulla, or from some of the anterior ganglia of the cerebellum.

In the red-blooded animals the nerves of the spine arise from the medulla spinalis in two bundles of medullary filaments, which unite after the posterior bundle has formed a ganglion. They afterwards separate into two trunks, the anterior of which communicates with the great sympathetic nerve by one or two filaments, and a ganglion is always formed at the place where they unite.

The great sympathetic nerve, which is constantly found in all red-blooded animals, exists in none of those with white blood; unless we should regard as that nerve, the two nervous cords which unite all the ganglia, and which are commonly called medulla spinalis in the crustacea, insects and worms. Were this opinion adopted, a medulla spinalis would be no longer attributed to those animals, and the absence of that production would then be the common character of all the white-blooded classes.

Instead of having the parts, which represent the brain and medulla spinalis enclosed in bony cavities, the lower orders of animals have them inclosed in the common cavities, with the other viscera.

Brain and Nerves of the Crustacea.—The crustacea, which, in their organs of motion, very much resemble the other insects, though those of circulation and respiration are exceedingly different, have also a similar nervous system, at least in the essential parts.

In such of the genus cancer as have long tails, the middle part of the system is a knotted cord, which extends from one extremity of the body to the other. The short-tailed kind, commonly called crabs, have a medullary circle in the middle of the abdomen, whence the nerves of the body proceed like radii.

In these animals the brain is placed at the anterior extremity of the snout, and consequently at a considerable distance from the mouth, which opens under the corselet. On this account the cords which make the collar of the œsophagus are more elongated than in other animals.

A. Brain of the common Cray-Fish, (Asellus Fluvialis, Fab.)—The brain of this animal forms a mass which is broader than long, and distinctly divided on the superior surface into four round lobes. Each of the middle lobes produces an optic nerve from its fore part. This nerve proceeds directly into the moveable tubercle which sustains the eye, and is there dilated and divided into a multitude of filaments, which form a pencil, and unite to all the small tubercles of the eye.

Four other nerves arise from the inferior surface of the brain; these proceed to the four antennæ, and detach some filaments to the neighbouring parts. The cords which form the collar, arise from the posterior part of the brain. About the middle of its length, each detaches a large nerve, which extends to the mandibles and their muscles. These cords unite under the stomach in an oblong ganglion, which furnishes nerves to the different pairs of jaws. On leaving this part, the two cords remain near each other throughout the whole length of the corselet, where they form five successive ganglia, placed between the articulations of the five pairs of feet: each foot receives a nerve from its corresponding ganglion, which penetrates to the extremity of the foot: the nerve of the forceps is the largest. The medullary cords extend into the tail, where they are so intimately united that it is not possible to distinguish them. They form six ganglia, the five first of which produce each two pairs of nerves; the last produces four, which are distributed as radii to the scaly fins that terminate the tail.

The hermit crab, (*Pagurus*, Fabr. *Bernhardus*, Linn.)

the

the tail of which is not covered by articulated scales, appears to have much fewer ganglia than the cray-fish. We have observed only five.

In the *squilla*, Fabr. there are ten ganglia, without reckoning the brain: that at the union of the two cords which form the collar, transmits nerves to the two forceps, and to the three pair of feet which immediately succeed them, and which in these animals are ranged almost on the same transverse line; this ganglion is therefore the longest of all. Each of the three following pairs has a particular ganglion. There are afterwards six ganglia in the length of the tail, which distribute their filaments to the thick muscles of that part. The brain produces immediately four trunks on each side, viz. the optic, those of the two antennæ, and the cord which forms the collar. As the antennæ are placed more posteriorly than the brain, their nerves are directed backward.

B. In the Common Crab (*Cancer Menas*, Linn.)—The brain of the crab resembles that of the cray-fish in its form and situation: it also furnishes analogous nerves, but they are directed more towards the sides, in consequence of the position of the eyes and the antennæ. The medullary cords which form the collar, detach each a nerve to the mandibles, but the cords are prolonged much farther backward than in the cray-fish before they unite. They join only in the middle of the thorax, at which place there is produced a medullary mass of an oval ring-like figure, which is eight times the size of the brain. The nerves which proceed to the different parts arise from the circumference of this ring. It furnishes six nerves on each side to the jaws and the five feet, and there is a single nerve which arises from the posterior part, and proceeds to the tail. This medullary ring may be said to represent the usual knotted cord, but if it has any ganglia they are not visible.

C. In the Oniscus Asellus.—The two cords which compose the middle part of the nervous system in this animal, do not perfectly join. We can distinguish them throughout the whole of their length. There are nine ganglia, exclusive of the brain; but the two first and the two last are so close together, that the number may be reduced to seven.

D. In Monoculi.—We know not the nervous system of the molucca crab (*limulus gigas*, Fab. *Monoculus polyphemus*, Linn.) In the monoculus apus of Linnæus, however, the indistinct nature of that system, joined to some other peculiarities of organization, would almost induce us to class the animal with the inarticulated worms. The brain is a small globule, nearly transparent, situated under the interval of the eyes. The medullary cord is double, and has an enlargement at each of the numerous articulations of the body; but the whole is so thin and transparent, that the real nature of the cord can scarcely be ascertained.

Brain and Nerves of the Larvæ of Insects.

A. Coleoptera.

1. Larva of the Scarabæus Nasicornis.—We shall give a particular description of the nerves of this larva, because their distribution is essentially different from that which takes place in the other coleoptera.

The brain is situated under the great scale which covers the head immediately above the origin of the œsophagus: it consists of two approximated lobes, which are very distinct at the front and back part. Four nerves arise from the anterior part, two on each side, which are lost in the cirri and parietes of the mouth.

From the lateral and somewhat posterior parts of the brain, there arises a pair of nerves, which, embracing the

œsophagus, proceeds inferiorly to form the nervous cord we shall presently describe.

Another pair departs from the inferior surface of the brain, or that part which rests upon the œsophagus: these are first directed forward; they afterwards turn inward, and proceed above the middle and superior part of the œsophagus, in order to approach each other. When they come in contact, they unite and form a small ganglion, which produces a single nerve; this nerve, continuing to proceed posteriorly, passes below the brain, and accompanies the œsophagus to the stomach. It there enlarges again into a ganglion, which furnishes some small nerves that are sent to the stomach, and one more considerable, which is continued along the intestinal canal, and sends off, at regular distances, lateral filaments, which are lost in the coats of this tube. This nerve is analogous to that which Lyonet has described under the name of *recurrent*, in the caterpillar of the *cessus*.

The medulla spinalis, which, as we have shewn, is formed by the posterior pair of nerves of the brain, is very thick at its origin: it forms a large fusiform ganglion about 0,005 metre long, and half a millimeter broad. Four or five contractions appear on its anterior part, but they are so slight that they seem only transverse furrows. The posterior part of this ganglion is smooth.

From the lateral parts of this large ganglion, which extends very little beyond the third ring of the body, a great number of diverging nervous filaments are produced. Those which are nearest the head ascend a little; those which succeed them proceed almost transversely; and the last are directed more and more posteriorly: the length of each is in proportion to its distance from the anterior part of the ganglion. The two most posterior filaments are therefore the longest.

2. Larva of the Stag Beetle (*Lucanus Cervus*).—The nerves of this larva differ greatly from those of the preceding, although the perfect insects are so nearly allied in genera.

The brain consists of two contiguous and almost spherical lobes; these produce four nerves anteriorly for the antennæ and the parietes of the mouth: two inferiorly, which first proceed forward, then turn back, pass again under the brain, and form a nerve known under the name of *recurrent*. Lastly, two posteriorly, which form a collar round the œsophagus, and join underneath, to compose the nervous cord of the body. This cord is formed of eight ganglia, which extend to the ninth ring of the body. The distances between these ganglia are very unequal; they are joined by very slender and closely approximated nervous filaments. The first ganglion, from the head, is very large, and almost spherical; it is followed almost immediately by the second, which is one-half less, and which is distinguished from it only by a kind of contraction; the first produces four pairs of nerves on each side; one ascends to the head, the other three diverge and are lost in the muscles of the abdomen, and in those that move the head. The second ganglion, besides the two nerves that unite it to the third, produces two other nerves, which are also directed backward, and lost in the muscles of the fourth ring. The third ganglion, and those that follow as far as the eighth, are similar to the second; with this difference, that they are much more distant from each other, and that they produce longer filaments, in proportion as they are situated more inferiorly. Lastly, the eighth and ninth ganglia are so close together, that they seem to form but one, with a slight contraction in the middle. This double ganglion produces three pairs of nerves,

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nerves, which are much elongated, and extend to the parts near the anus.

3. *Larvæ of the Cerambyx, Hydrophilus, Carabus, and Staphylinus.*—The nerves of these larvæ being very similar, it will be sufficient to describe them in one genus only. We shall take for our example the larva of the great diver (*Hydrophilus piceus*).

The brain in this animal is situated in the head, above the origin of the œsophagus; it is formed of two lobes which lie very close together. From its anterior part it detaches some filaments to the palpi, the antennæ, and the parietes of the mouth. Its lateral parts produce two cords which surround the œsophagus, and which are the origin of the nervous cord situated inferiorly. It is probable that recurrent nerves also arise from this inferior part, but we have not yet been able to discover them. The chief nervous cord is composed of ten ganglia, each of which produce three pairs of nerves that are lost in the muscles of the abdomen, and without any distinct appearance of their being distributed to the intestines. This induces us to believe that there is a recurrent nerve. The first ganglion is very large; it is prolonged posteriorly into two nervous filaments, considerably removed from each other; the second is almost similar, but the third is very near the fourth, which produces only a single filament posteriorly. All the others, as far as the tenth, present no peculiarity. The last is divided by a sensible contraction; from the first portion a single filament arises on each side, and from the second, three pairs of nerves are detached: thus four pairs of nerves arise from this ganglion. The fourth pair is directed to the rudiments of the parts of generation, which are very distinct in these larvæ in the last period of their growth.

4. *Larva of the Water Beetle (Dytiscus Marginalis).*—The brain of this larva is spherical, and consists of a single lobe, situated in the head above the origin of the œsophagus; its anterior part produces some filaments for the mouth; and its lateral parts the two optic nerves; the latter are composed of two parts which are very distinct as to form. The first portion, or that which is next the brain, is of an oval figure, pointed at the extremity which joins the brain: the other extremity is rounded, and produces a slender nerve, which goes directly to the eye. It is nearly of the same thickness throughout the whole of its extent; but it is enlarged at its free extremity into a bulb, from which the nervous filaments of the eye arise.

The two cords which embrace the œsophagus are short and thick; they arise from the inferior surface of the brain, and immediately unite below the œsophagus, in a large square-shaped ganglion, which produces anteriorly the nerves of the mandibles, and posteriorly two cords, which pass from the head into the corselet. There is a greater distance between this first ganglion of the nervous medulla and the second, than between any of the others. It is more than double that which exists between the two next ganglia. The second ganglion is round; it produces two pair of nerves laterally; the anterior for the muscles which act upon the head, the posterior for those which move the anterior feet. There are two cords posteriorly, which are directed into the breast. The third ganglion is similar in every respect to the second; it furnishes nerves to the intermediate pair of feet. The fourth ganglion is also produced by the two cords which come from the preceding; it is situated on the union of the abdomen with the breast; it is more broad than long. Laterally it produces two pair of nerves, which run transversely parallel, and are lost in the muscles. The other eight ganglia are placed close behind each other, and the space between them is so small, that we can scarcely perceive

the two nervous filaments which unite them; they also decrease in thickness, without diminishing in breadth, as they extend posteriorly. They all furnish laterally a pair of very long nerves, which float in the abdomen, and for the most part terminate in the muscles that move the wings. One pair, however, proceeds to the rudiments of the parts of generation.

B. *Orthoptera and Hemiptera.*—The nerves of the larvæ of orthoptera and hemiptera present no sensible difference from those we observe in the perfect insects. It will be sufficient, therefore, to describe the nerves of the latter.

C. *Hymenoptera.*—In the larva of the saw-fly (*Tenthredo*, Linn.), which has a large head furnished with eyes, the brain is very broad and short; it seems to form four bulbs of equal magnitude, and nearly spherical; the two external serve as the base of the optic nerves, which are slender, and which enlarge a little at their other extremity. The first ganglion is produced by two very small nerves, which arise from the inferior surface of the brain, and which, after having embraced the œsophagus, unite under the first ring of the body; it furnishes filaments to the muscles of the feet, and terminates posteriorly in two other nerves, which, at the distance of one line, produce a second ganglion, and so on in succession; the nervous cord is in this manner formed of eleven ganglia, without reckoning the brain; the farther the ganglia are removed from the head, the more they diminish in thickness; they are all nearly of a round form.

D. *Neuroptera.*—In the larva of the lion-ant (*Myrmeleon formicarius*), the nervous system has some relation to that of the larva of the dipterous insects which we shall afterwards describe.

There is a brain situated in the head; it produces nerves analogous to those we have already pointed out in the other larvæ. The nervous medulla consists, in the first place, of two ganglia, which are composed of two lobes, situated close together; these two first ganglia are separate from the others, and contained in the part corresponding to the feet, or in the thorax. The remainder of the nervous medulla is enclosed in the abdomen; it consists of eight ganglia, placed in an exceedingly close series, and each formed of two lobes; the first is nearly double the size of the other seven. This succession of ganglia appears to the eye like the extremity of the tail of a rattle-snake; the last is round; the others are more broad than long. All these ganglia furnish nerves to the muscles. It is probable that this disposition and approximation of the ganglia have a relation to the changes which take place in the insect at the moment of its metamorphosis, as its abdomen then occupies six times the space it does in the larva state.

In those larvæ of neuroptera, which are nearly as long as the perfect insect, we find that the ganglia are separated in the usual manner.

The larva of the ephemera has eleven ganglia, without including the brain, which furnishes two large optic nerves. There are three ganglia in the thorax, and seven in the abdomen: the first six, reckoning all the ganglia, furnish more nerves than the five last.

The larvæ of the dragon-flies have a small two-lobed brain, which produces optic nerves, larger or smaller according to the species. The genus *æstivna* has them the largest. The rest of the nervous system forms a series of ganglia of different sizes. In the *æstivna*, the corselet contains six, the two last of which are the largest of all. There are seven final and equal ganglia in the abdomen.

E. *Lepidoptera.*—The nervous system of caterpillars consists

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fists of a series of thirteen principal ganglia, which furnish filaments to all other parts of the body. The first of these thirteen ganglia is situated in the cavity of the head; it lies above the œsophagus, and supplies the place of the brain: it appears formed superiorly by the union of two round tubercles, inferiorly it is concave, and corresponds to the convexity of the œsophagus. This ganglion communicates with the rest of the nervous cord by two thick filaments, which embrace the œsophagus, and which are united below it to the anterior and lateral part of the next ganglion; it besides produces eight pairs of nerves.

The first partly unites with other filaments; produces some for the œsophagus, and forms several remarkable ganglia below the upper lip. The largest and most posterior, which Lyonet has named the *first* frontal ganglion, is prolonged posteriorly into a thick recurrent nerve, which is continued the whole length of the body, near the back; this recurrent nerve furnishes filaments to the œsophagus and its muscles; it penetrates into the dorsal vessel, and it afterwards re-appears, and glides along the œsophagus as far as the stomach. This nerve produces, at certain distances, very fold filaments, which keep the œsophagus attached to the skin of the back.

Besides the recurrent nerve we have just noticed, several filaments are furnished by the posterior frontal ganglion to the muscles of the œsophagus, and two to the *second* frontal ganglion; the latter also detaches several filaments to the œsophagus, and, in particular, a very remarkable one, which, by a sudden enlargement, constitutes the *third* frontal ganglion. This ganglion likewise affords several filaments to the œsophagus.

The second pair of the brain appears chiefly intended for the antennæ, though it furnishes several filaments to the neighbouring parts. The third pair terminates particularly in the antennæ, and the muscles which move them. The fourth pair is proper to the eye of each side; it accompanies the air-tube which goes to that part, and is divided into six branches, that penetrate into the six eyes, which, by their union, form that of the caterpillar. The fifth is directed a little backward, where it divides into two branches; one posterior for the adductor muscles of the jaw; the other anterior, which is lost in the membranes that cover the frontal scales. The sixth and seventh pair unite to form a ganglion from which several filaments are detached, to the œsophagus and its muscles. Finally, the last pair of the brain is entirely lost on an air-tube.

But besides these nerves produced by the first nervous ganglion, several others are detached from it, which we shall briefly notice. In the first place, we observe, that it furnishes several filaments to the dorsal canal: it afterwards gives origin to a pretty long filament, which terminates on the air-vessels, between the second and third ganglion. Lastly, it produces a nervous ring, which embraces the œsophagus inferiorly like a girth, and supplies it with several filaments. The second ganglion is intimately united with the third, and is distinguished from it only by a contraction. The nerves which proceed from the anterior part appear to be produced by the second ganglion, and those which arise from the posterior part, seem to belong to the third.

Besides the two filaments which form the collar round the œsophagus, and which unite the first to the second ganglion, the latter has four pair of very distinct nerves. The most anterior pair is sent forward to the mouth, but in its course it divides into two branches: one terminates in the tongue and the adjacent parts; the other branch proceeds to the lateral parts, where it sub-divides, to supply the mandible, the jaw, and upper lip, communicating, at the same

time, with the first ganglion, and with the second frontal. The second pair proceeds to the jaw, but detaches a number of filaments to the muscles of the neighbouring parts. The third pair is destined for the spinning apparatus; in its course it gives filaments to the silk vessels and muscles of the head. The fourth pair arises near the contraction, which indicates the union of the two ganglia, between the head and the first ring; it is lost in the fat, in the skin of the neck, and in the muscles inserted into the head.

The third ganglion, which, as we have observed, is united to the second, produces only three pairs of nerves: the posterior is merely the continuation of the nervous trunk of the other two pairs; the anterior is entirely lost in the muscles and the skin; the intermediate pair supplies that part also; but it is distributed chiefly to the muscles, which move the articulations of the leg.

We have already stated, that each ganglion communicates with that which precedes, and that which follows it by two filaments that are distinct from their origin, and are the bifurcation of a single trunk. The middle of this bifurcation, from the third to the eleventh ganglion, produces a small nerve, which Lyonet has named the *spinal frænum*: this single nerve is situated in the middle line; it presently divides into two branches, which follow the divisions of the air-tubes, and penetrate with some of them into the longitudinal vessel.

The fourth and fifth ganglia produce the same number of nerves, the distribution of which is also nearly similar; their anterior pair proceeds to the muscles, and to the skin of the rings to which it corresponds; the intermediate pair furnishes, more particularly, filaments to the muscles of the leg.

The sixth ganglion, which corresponds to the fourth ring of the body, also furnishes two pair of nerves, which are lost in the muscles and the skin.

The nerves of the five following ganglia are distributed nearly in the same manner.

The twelfth ganglion, and the thirteenth, which is the termination of the nervous cord, are very close to each other, though distinct. The distribution of the nerves, produced by the first, presents nothing remarkable. Those furnished by the second are very long, being sent to the last rings, in the skin and muscles of which the first pair is partly lost. The second pair is only subdivided when it has reached the first ring; it there produces a plexus, from which a number of filaments are detached to the great intestine. The trunk appears to end on the parietes of the rectum towards the anus.

F. Diptera.—The nerves of the larva of the *Stratiomyis* have some resemblance to those of the larva of the *Scarabæus nasicornis*.

The brain is formed of two lobes, placed close together, and almost spherical; it is situated above the œsophagus, on a level with the second ring of the body. A number of small nervous filaments arise from its anterior part, and are distributed to the parietes of the mouth, to the mandibles, and to all the adjacent parts. These nerves are very distinct, particularly those which are removed from the middle line. The posterior part of these two lobes sends off two thick branches which embrace the œsophagus, and form the origin of the nervous medulla. This nervous cord is very short, and its diameter is one-half less than that of the brain; it consists of eleven ganglia placed very near each other, each of which produces one pair of nerves.

These nerves proceed directly backward. Swammerdam has erroneously represented this cord as twisted, like the tail of a scorpion, and producing nerves on the left side only.

only. It is true, that those which arise from the right side are parallel to the cord, while those of the left side remove farther from it. The ganglia, thus approximated, are eleven in number, and in a straight direction; they produce long nerves, which are lost in the muscles.

The nerves of the cheese-worm (*Musca putris*, Linn.) are distributed in a very curious manner. The brain is situated immediately above the origin of the œsophagus, behind the head; it is very large in proportion to the rest of the body; it is rounded posteriorly, and notched anteriorly, as if it were formed of two lobes.

A pair of nerves arise from the anterior part of the brain, proceed forward, and are distributed to the mouth, and even to the parietes of that cavity. It should be remarked, that these nerves experience a very conspicuous enlargement previously to their distribution.

Posteriorly the brain presents an aperture, which affords a passage for the œsophagus: the nervous part, situated on its sides, may be regarded as the cords which produce the medulla, and all below the œsophagus as the medulla itself.

Two pairs of nerves arise from the origin of the nervous medulla; these are directed forward, and principally distributed to the viscera, and to some of the muscles of the anterior rings. The third pair of nerves which this medulla produces is the most remarkable; it comes from the part which nearly corresponds to the third ganglion; we say nearly, because in this insect the ganglia are so close to one another, that the medulla seems to form only one piece on the surface of which we merely perceive twelve transverse wrinkles, which indicate the number of ganglia. This third pair extends almost transversely. At a certain distance from its separation it swells into a ganglion, and then divides into several filaments; these are the ganglia which Swammerdam supposes are intended for the muscles of the wings, when they shall exist in the perfect insect.

Another pair of nerves, which go to the muscles of the body, arise from each of the other contractions; but they require no particular remark.

Brain and Nerves of Perfect Insects.

A. Coleoptera.

1. *In the Stag-beetle (Lucanus Cervus).*—We find in this insect, as in its larva, a brain composed of two approximated spherical lobes, situated above the œsophagus; its anterior part produces two pair of nerves, which terminate in the palpi and other parts of the mouth. There is probably a recurrent nerve, but our researches have not yet discovered it.

There are two ganglia on the lateral parts of the brain, which are almost as large as each of the lobes. In their form they resemble a pear, and rest upon the brain by their base; they are prolonged transversely into a large nerve on each, chiefly intended for the eye. Before the nerve arrives at that part, we observe it detach a slender filament, which enters into the great mandible; then, more externally, another filament which enters into the cavity of the antennæ; lastly, the nerve itself, having reached the eye, swells again into a bulb, and produces a number of nerves, which we shall describe when we treat of the organ of vision.

Posteriorly the brain produces two very long and slender nerves which accompany the œsophagus to the point where the head unites to the thorax, immediately above the articular condyle. The two nerves situated above the œsophagus, then, produce a ganglion of a long oval form, from which

several nervous filaments are detached to the muscles that move the mandibles, and those that act on the head. This ganglion terminates posteriorly in two parallel nerves, which proceed to the middle of the thorax, above the origin of the two pair of feet, and there form a second ganglion of an hexagonal figure; this ganglion furnishes filaments to the muscles of the feet, and likewise terminates posteriorly in two nerves, which extend above the union of the corselet, with the pectus; they there unite and form a third ganglion, which is crescent-shaped, with the convexity posterior: two other nerves proceed from this convexity, which almost immediately produce another ganglion of the same form, but smaller. This ganglion gives origin to five nerves: two lateral, destined to the muscles of the intermediate feet, into the coxæ of which we observe them enter: posteriorly two, which are slender, and distributed to the muscles of the hind feet and the wings. The fifth is situated in the middle line; it is also thicker, it swells almost immediately into an oval-shaped ganglion, which is divided posteriorly into two exceedingly slender filaments. These filaments, which pass into the abdomen, form a kind of bridge in the breast, in which they occupy the middle line, and leave between them the muscles of the feet and wings of either side.

2. *In the Scarabeus Nasicornis.*—With respect to the nerves, this insect differs in the perfect state from the description we have given of its larva. The optic nerves, which are very distinct and large, proceed to the eye, into which we observe them enter by a multitude of filaments when we make a horizontal section of that organ.

The nervous cord presents a very conspicuous difference. In the larva there is only a single ganglion; but the perfect insect has several, which are very distinct. The first is situated above the condyle; it proceeds from the two posterior filaments of the brain, and is distributed to the muscles which move the head on the corselet. Its posterior part produces two filaments, which pass into the breast, where they unite towards the middle part, and form a triangular ganglion; from the sides of which three pairs of nerves arise, and are distributed to the muscles. Its posterior angle detaches two parallel nerves, which proceed into the breast, where they form a third and a fourth ganglion, situated very near each other, and apparently divided into two lobes by a longitudinal furrow. All the other nerves of the body depart from those two ganglia by an irradiation, precisely in the same manner as in the larva.

3. *In the Water Beetles (Dytiscus) and the Ground Beetles (Carabus).*—The nervous system is entirely similar in these insects. The brain is formed of two large hemispheres, separated from each other by a longitudinal furrow. The anterior part produces the nerves of the mouth, and the lateral parts those of the eyes and antennæ. The nerves of the eyes are short, and differ greatly from those of the stag beetles; they are of a pyramidal form: their base corresponds to the eye, and their apex to the brain. We have not observed any recurrent nerves.

The two filaments which produce the nervous cord depart from the brain, not posteriorly, but inferiorly, on the side of the optic nerves: they are very short, as they pass immediately under the œsophagus. They furnish some filaments to the muscles and the œsophagus. The first ganglion they form lies under a kind of bridge, formed of horny substance, which is situated in the middle of the head, and which affords a point of attachment to the muscles of the jaws; it is of an elongated and quadrangular figure, and occupies almost the whole space that corresponds to the condyle above which it is placed. It is terminated posteriorly by two filaments which proceed in a parallel direction,

direction, and form a second ganglion in the middle part of the corselet. This ganglion furnishes nerves to the muscles of the anterior feet. We observe them enter into the cavity of the coxæ. The third ganglion appears bilobed, or formed of two oval bulbs, the union of which is marked by a longitudinal furrow. This ganglion is situated longitudinally above the anterior inferior edge of the breast. It sends filaments to the muscles of the intermediate feet. The fourth ganglion is very near the preceding; it is of a roundish form, and is distributed to the muscles of the posterior feet and the wings. The space between the fifth and sixth ganglion is very small: their form is round; and they furnish filaments to the muscles that move the abdomen on the breast. The remainder of the medullary cord is formed by a series of five ganglia, situated so close to one another, that they appear to the naked eye to form only one; but with a glass they may be observed very distinctly. We even perceive the two filaments produced by each to form the succeeding ganglion. The fifth presents a transverse furrow, which seems to indicate the union of two ganglia. The end of the medulla appears to float in the abdominal cavity, but above the intestines.

4. *In the Great Diver (Hydrophilus Piceus, Linn.)*—The brain of this insect, which is situated in the head, and above, the origin of the œsophagus, consists of two spherical bulbs closely united. The lateral parts give origin to the optic nerves which proceed towards the eyes without changing their diameter, but which terminate there by a triangular bulb that produces a vast number of filaments externally.

The anterior part of the brain detaches some filaments intended for the parietes of the mouth. We also remark, at the same place, a small spherical ganglion, which appears to belong to the recurrent nerve that accompanies the œsophagus.

Two filaments, which should produce the medullary cord, arise inferiorly; they embrace the œsophagus at their separation, unite immediately below it, and again, in the cavity of the head, to form a small ganglion, which furnishes nerves for the muscles of the mandibles and the palpi. Two nervous cords are detached from the posterior part of this first ganglion. Almost immediately after their origin, they pass under a horny arch, which is produced by the internal surface of the ganache. We observe that they re-appear posteriorly, and proceed into the corselet. They form a second ganglion exactly in the middle of the corselet; its figure is quadrangular. The anterior and posterior angles produce the nerves of the medulla, and the lateral those intended for the muscles of the anterior feet. The interval included between the second and third ganglion of the medulla is very great. The third ganglion corresponds to the insertion of the intermediate feet: it is large, and of a round form; it furnishes nerves to the wings, and to the intermediate pair of feet. Posteriorly it produces two cords, which, at the distance of about half a line, swell and form a fourth ganglion, almost as large as the preceding. This ganglion detaches, from its inferior part, a number of filaments for the muscles of the posterior feet, which are specially appropriated to swimming. Two other very short cords produced by the posterior part of this ganglion swell into a fifth, which is one-half less than the former, and which furnishes a single cord posteriorly. This cord passes into a kind of longitudinal groove, formed above the horny appendix, that furnishes attachments to the muscles of the coxæ. A sixth ganglion is situated at the posterior and wide part of this appendix: at a certain distance, and exactly above the union of the abdomen with

the breast, a seventh appears. These two ganglia produce only one pair of nerves, which are distributed to the muscles.

There are only two ganglia in the abdomen; one corresponds to the middle part of the second ring; the other, which is the last and ninth, is situated above the union of the second segment with the third. The last ganglion but one is in every respect similar to the two preceding; but the ninth is one-half larger, and produces posteriorly four pair of nerves, which are distributed on both sides to the parts of generation.

B. *Orthoptera*—*In the Cockroach (Blatta Americana.)*—The brain of this insect is composed of two lobes, separated by a very distinct notch anteriorly. The optic nerves arise on the sides, and its anterior part detaches some filaments to the parietes of the mouth, and to the instruments of manducation.

The nervous cords which form the medulla arise from its inferior surface. They proceed directly downward, and closely embrace the œsophagus. They afterwards proceed in a parallel direction, but very distinct from each other, towards the corselet. When they reach its middle, they form a very large ganglion, which produces three pairs of nerves laterally, and one posteriorly. The first lateral nerves ascend obliquely towards the head, and furnish filaments to the muscles that move it on the thorax, and which act on the antennæ and the parts of the mouth. The others are distributed to the muscles of the first pair of feet.

The posterior nerves proceed in a parallel direction backward. At the middle of the pectus they produce a still more considerable ganglion than the second, which furnishes laterally nerves to the intermediate and posterior feet, as well as to the muscles of the wings. It also sends off two cords posteriorly, which, by their union at the junction of the abdomen and the breast, form a fourth ganglion, situated on a projecting horny substance to which the muscles of the coxæ are attached.

After this fourth ganglion there is only a single nerve, which has, at certain spaces, small enlargements. Five of these swellings may be counted. Each produces a pair of nerves for the muscles of the rings of the abdomen: the first is the largest, and furnishes besides two nerves which ramify in the parts near the anus.

In the Great Green Grasshopper (Gryllus Viridifissus, Linn.)—The brain is situated in the head above the œsophagus: it consists of two lobes, which have the form of pears, united at their base, and prolonged at the other extremity into an optic nerve for the eye of each side. The anterior part also produces two nerves of a pyramidal form, the base of which rests upon the brain. Some filaments arise from the apex of the pyramid, which are lost in the mandible, the jaw and its gales, as well as in the upper lip.

Between these two anterior nerves we observe a small ganglion, which is produced by the union of the two filaments of the inferior surface of the brain. This is the recurrent nerve which follows the intestinal canal. Posteriorly, and a little inferiorly, we observe the origin of the two cords which form the nervous medulla. They embrace the œsophagus, below which they are immediately directed, and form a ganglion. This first ganglion is protected and covered by a kind of horny bridge of a reddish colour. It furnishes nerves to the muscles of the mouth, and to those of the head within which it is inclosed. Posteriorly it produces two long nervous cords, which penetrate into the corselet. These two cords unite about the middle of the thorax before the appendix, which gives attachment to the muscles of the coxæ and the anterior pair of feet. At this union they form a large

a large bilobed ganglion, of an irregular quadrangular figure, the sides of which produce several filaments for the muscles of the anterior feet.

The posterior part of this second ganglion furnishes two filaments, which penetrate into the breast. The solid appendices of the coxæ, which afford insertions for the muscles, pass between these two filaments. They form a third ganglion, which corresponds to the middle space included between the two intermediate feet. This ganglion sends nerves to the muscles of the wings and the feet.

The fourth ganglion is also contained in the breast. It is situated before and between the posterior pair of feet. It is produced by two nervous cords from the preceding ganglion; and furnishes two posteriorly, which are so close to each other, that they appear to the naked eye to make only one cord. This nerve is received and contained in a kind of groove formed above the triangular piece, which affords an attachment for the muscles of the feet.

The other ganglia, which are all situated in the abdomen, are six in number. They are, the last excepted, of the same size and form, placed at equal distances, and produced by two similar and closely approximated cords. Each furnishes two pair of nerves for the muscles of the abdominal rings.

The last ganglion of the medulla is one-half larger than the five preceding. It is situated below the parts of generation, to which it is distributed by four pair of filaments.

*In the Mole-cricket (Acheta Gryllo-talpa).—*The brain of this insect is also composed of two rounded lobes, which are particularly distinct at the posterior part. We can clearly perceive the origin of the nerves of the palpi, of the antennæ, of the smooth eyes, and of the eyes properly so called. In general the nerves of the principal medulla are similar to those we have described in the cock-roach. The two first ganglia are produced by two nerves. The first, which is in the corselet, supplies the muscles of the head, breast, and anterior feet. The second, which is larger, and in the breast, gives filaments to the muscles of the wings, and of the intermediate and posterior feet. It also sends two nerves posteriorly, which produce the abdominal ganglion. The cord then becomes single and flat, like a ribband, and contains only four ganglia, occurring at different distances. Each produces two pairs of nerves, which are directed posteriorly, and distributed to the muscles. The first corresponds to the middle part of the first abdominal ring; the second to the third, the third to the fifth, and the last to the ninth.

This last ganglion is the most remarkable of all. It is of an oval shape, and produces, from the whole of its circumference, nerves which are distributed to the neighbouring parts. Two, which are longer than the others, diverge as they proceed backward, and thus represent a bifurcation of the medullary cord. These branches furnish filaments to the parts of generation.

*C. Hemiptera—In the oval Water Scorpion (Nepa Cinerea, Linn.).—*The nervous system of this insect consists of three ganglia. The first, which supplies the place of the brain, is situated in the head. It is formed of two approximated lobes. These lobes are pyriform, and touch each other at their base. Their summits are directed obliquely forward towards the eyes, in which they terminate, and thus answer to the optic nerves by their anterior extremities. The middle and anterior part of these lobes also produce some filaments for the parts of the mouth. Posteriorly, the brain detaches two cords, which embrace the œsophagus as they pass below it. They unite at the origin of the breast in a tetragonal gan-

glion: each of the angles of which produces or receives several nerves. The anterior receives the two cords which come from the brain; the posterior, the two which are the continuation of the medullary cord. Each lateral angle produces a fasciculus, composed of four nerves, which are directed to the muscles of the breast and anterior feet. We observe one of them enter into the cavity of the coxa.

The two nerves produced by the posterior angle of the second ganglion proceed in a parallel direction backward. Having arrived in the breast above the horny appendix, to which the muscles of the coxæ of the intermediate and posterior feet are attached, they swell into a large round ganglion, considerably more voluminous than the brain. A vast number of nerves are detached from the edges of this ganglion, like solar rays. The two most remarkable filaments are exceedingly long and slender. They extend from the breast nearly as far as the anus: we have observed them to terminate by three minute branches in the parts of generation of the male, furnishing, at the same time, some filaments to the adjacent parts. All the other filaments, which proceed from this third and last ganglion, are destined to the muscles. We can very plainly distinguish those that belong to the middle and intermediate feet, as they are somewhat larger than the others.

*D. Lepidoptera.—In the Zig-zag Moth (Phalana Dispar, Linn.).—*The brain in this species is almost spherical. We, however, perceive a longitudinal furrow on the middle line. Its anterior part produces some exceedingly slender nerves. There are two large optic nerves on the sides, which proceed into the concavity of the eye, where they terminate by a bulb, which produces a great number of filaments.

The œsophagus passes immediately behind the brain, through a small triangular interval, the posterior sides of which are formed by the two cords of the medulla. These cords afterwards unite, and proceed in the form of a single trunk, on the middle part of which we perceive only a longitudinal furrow. Arrived in the corselet, it forms a ganglion, the surface of which is reddish. This ganglion produces two nerves posteriorly, which leave between them an interval that affords a passage for the horny appendices to which the muscles of the coxæ are attached. The two cords again unite behind these appendices in the same cavity of the breast, and produce a much larger ganglion, the lateral parts of which furnish nerves to the muscles of the wings and feet. It is prolonged posteriorly into a single cord, which again enlarges when it arrives above the articulation of the breast with the abdomen into a third ganglion.

It should be remarked, that this large ganglion, which has the form of a heart, is the only one, besides the brain, of a completely white colour. All the others exhibit darker shades, and we observe in them, when viewed by a glass, reddish points more or less elongated and sinuous, that resemble the blood-vessels of injected glands.

The third ganglion is prolonged into a single cord, which produces a fourth ganglion above the first ring of the abdomen. The latter, as well as those that succeed it, detach on each side a long slender nerve which passes under the muscular fibres, precisely in the same manner as the threads of the woof pass through the warp in cloth. Their direction is completely transverse. The fifth ganglion does not differ from the preceding. It is prolonged into a single cord, upon which we can still very distinctly perceive the longitudinal furrow. It is situated in the middle part of the third ring of the abdomen. The sixth ganglion is, in every respect, similar to the preceding; it is placed in the middle of the fourth ring. Finally, the seventh and last ganglion is much larger than those that precede it in the abdomen. It is of an

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oval form, and situated upon the lunula that terminates the fifth abdominal ring posteriorly. Besides the nerves intended for the muscles of the fifth ring, which are detached from this ganglion in two distinct parts, it produces four other pairs posteriorly. These nerves appear to be distributed to the parts of generation, and to the muscles of the last abdominal rings, which, in the female, are elongated like a tail to assist in laying eggs.

E. Neuroptera.—The insects with naked wings, that is to say, the hymenoptera, neuroptera, and diptera, which have frequently very large eyes, have also the optic nerves of a proportional size. This is particularly observable in the dragon flies. Their brain is formed of two very small lobes; but their optic nerves are dilated into the form of two large plates, which have the figure of a kidney, and which is spread upon all the inner surface of the eye next the head. The remainder of their medullary cord is exceedingly slender, and furnished with twelve or thirteen small ganglia, the last of which is, as usual, connected with the parts of generation.

F. Hymenoptera.—The brain of the bee is small, and divided into four lobes. It produces immediately the nerves which are distributed to the different parts of the mouth, and the two large optic nerves which are dilated and applied behind each eye as in the dragon flies. There are afterwards seven ganglia, three of which are in the corselet, and four in the abdomen. The nerves of the last chiefly supply the parts of generation.

G. Diptera.—The apiform fly (*Musca tenax*, Linn.) has a small brain, formed of two lobes, which are situated very close together, but distinguished by a longitudinal furrow; the anterior part produces a large nerve, which is afterwards distributed to the antennæ and the proboscis.

The optic nerves are very thick, cylindrical, and equal in diameter to the length of the brain, on the lateral parts of which they rest; they terminate at their extremities in very large bulbs, which correspond to the breadth of the eyes.

The first ganglion of the medulla is produced by two cords, which come from the posterior part of the brain, and embrace the œsophagus as a collar; it is very slender, and situated in the breast; it furnishes a pair of filaments to the muscles of the anterior feet.

The second and the following ganglia, in all three in number, are united to each other merely by a single cord. The last ganglion is one-half larger than that which precedes it. Posteriorly it produces eight or nine filaments, which are intended for the parts near the anus; the first of the three is situated in the breast, where it furnishes nerves for the muscles of the wings and the feet; the other two ganglia are in the abdomen; the last but one is placed above the union of the third ring with the fourth; and the last on the interior and inferior edge of the fifth ring.

In the hornet-fly (*Aphis crabroniformis*) we also observe a single cord uniting the abdominal ganglia, which are six in number.

The brain is similar to that of the syrphus; but the bulbs, formed by the optic nerves, are still broader, in proportion to the extent of the eyes they have to invest.

H. Gnathoptera.—In the great scolopendra (*Scolopendra morsitans*) the brain has a very singular form: it is, as usual, composed of two lobes, which are almost spherical; it produces laterally the optic nerves, which are very short, and may be observed to divide long before they reach the eye. The filaments are four in number; but two nerves arise anteriorly, which are so very thick, that they appear a part of the brain, to which they are equal in diameter. These nerves are particularly intended for the antennæ, into which

we observe them enter, and in which they may be followed on account of their magnitude.

The two cords which embrace the œsophagus proceed directly downward, and form a large ganglion at the union of the first ring with the head. The first ganglion produces two nerves posteriorly, and several towards the sides. A ganglion, precisely of the same shape, is placed above each of the articulations: thus there are, in all, twenty-four very distinct ganglia; the last of all is smallest, nearest the preceding, and seems to float in the abdomen; each detaches three pairs of nerves; one which ascends towards the head, a second which runs transversely; both these are distributed to the muscles of the abdomen: the third descends, and then proceeds backwards and upwards; it furnishes filaments to the lateral muscles, and to those of the back.

Organs of Sense.—We have very little to observe on this subject, in addition to what will be found in the article ENTOMOLOGY, under the divisions, *Organs of Taste, Palpi, Olfactory Organs, Eyes, Stemmata, Organs of Hearing.*

Few subjects in comparative anatomy and physiology have given rise to more various and contradictory opinions, than the organs of sense in some classes of animals. Much misunderstanding on this point has clearly arisen from the inconsiderate application to animals, of inferences drawn from the human subject. Thus, it has been supposed that those which possess a tongue, must have it for the purpose of tasting; and that the sense of smell must be wanting, where we are unable to ascertain the existence of a nose. Observation and reflection will soon convince us, that the tongue, in many cases (in the ant-eaters among mammalia, and almost universally in birds) cannot, from its substance and mechanism, be considered as an organ of taste; but must be subservient merely to the ingestion and deglutition of the food. Again, in several animals, particularly among insects, an acute sense of smell seems to exist, although no part can be pointed out in the head, which analogy would justify us in describing as a nose.

However universally animals may possess that feeling, which makes them sensible to the impressions of warmth and cold, very few possess, like the human subject, organs exclusively appropriated to the sense of touch, and expressly constructed for the purpose of feeling, examining, and exploring the qualities of external objects. This sense appears, according to the present state of our knowledge, to exist only in three classes of the animal kingdom; viz. in most of the mammalia, in a few birds, and probably in insects. All the observations and investigations of the structure of the antennæ, those peculiar organs which exist universally in the more perfect insects; and of the use which these animals generally apply them to; lead us inevitably to the conclusion, that they really are, what their German name implies (*Fühlhorn*; the literal translation of which is feeling horns) proper organs of touch; by which the animal examines and explores surrounding objects. Such organs are particularly necessary to insects, on account of the insensibility of their external coat, which is generally of a horny consistence; and also from their eyes being destitute in most instances of the power of motion.

We are not warranted in considering the tongue as an organ of taste in all animals, because it is subservient to that function in the human subject, and in some other instances. We have already observed, that this organ, in many cases, serves merely for taking in the food; and it is at least very doubtful whether it possesses the sense of taste in many others. Yet, on the contrary, we should not be warranted in denying the existence of the sense in these animals, nor even in such as are entirely destitute of a tongue; for this function may be

be exercised by other parts. The organ which is commonly considered as the tongue of insects, merely serves for taking in the food. But the accurate observations of professor Knoch, (in his Contributions to the Knowledge of Insects, in German,) renders it very probable, that the posterior pair of palpi, or feelers, possesses the power of taste in several of this class.

Numerous facts have long ago proved, that several insects can distinguish the odorous properties of bodies, even at considerable distances. But the organ in which this sense resides, has not hitherto been clearly pointed out. Since all red-blooded terrestrial animals smell only through the medium of the air which they take in in inspiration, several naturalists have supposed, that the stigmata of insects are to be considered as organs of smelling. Others ascribe this office, and with some probability, to the anterior pair of palpi.

There is no doubt that several insects possess the sense of hearing, but the organ of this sense is very doubtful. In some of the larger animals of the genus cancer, a part can be distinguished which seems to be analogous to the vestibulum of the former classes. A small bony tube is found on each side at the root of the palpi; its external opening is closed by a finer membrane; and it contains a membranous lining, on which a nerve, arising from a common branch with that of the antennæ, is expanded. The latter circumstance might favour an opinion, that the antennæ themselves are organs of hearing; but this is refuted by considering the exquisite sense of hearing, which some insects possess, who have no true antennæ, as the spiders; and by experiments on others, which shew that the sense of hearing is not weakened by removing the antennæ.

The compound eyes and the stemmata have been described in the article ENTOMOLOGY. The former are found in different numbers in most of the aptera, as also in the larvæ of many winged insects. When these undergo the last or complete metamorphosis, and receive their wings, they gain at the same time the large compound eyes. Several genera of winged insects, and aptera (as the larger species of monocoli) have stemmata besides their compound eyes. Farther investigation is necessary to shew how these eyes enable the insect to see; and to determine the distinctions between two such very different organs. Blumenbach considers that the stemmata are designed for seeing near objects, and the polyedrous eyes for distant ones; because butterflies have the latter only in their winged or perfect state, while in the caterpillar state they have only stemmata. He acknowledges, however, that this opinion is very doubtful, because some insects, which live completely underground, as the mole-cricket (*gryllus gryllotalpa*, Linn.) have both kinds of organs.

On the organs of the senses in this class, the reader may consult Lehmann, de sensibus externis animalium exanguinum: commentatio premio regis ornata, Goetting. 1798, 4to. F. J. Schelver versuch einer naturgeschichte der sineser werkzeuge bey den Insekten und Würmern; Essay towards the Natural History of the Organs of Sense in Insects and Vermes; Goetting. 1798, 8vo. Lehmann de antennis insectorum, 1799, 8vo. Knoch's neue beyträge zu der Insektenkunde; Contributions to the Knowledge of Insects.

Organs of the digestive Functions.—For a general account of the parts about the mouth and their nomenclature, see ENTOMOLOGY.

Jaws of the Crustacea.—Most of the genus cancer have at their mouth five or six pairs of organs, which must be regarded as jaws, since they move laterally in a horizontal plane; they are placed successively one over the other, and

the most exterior has been called by some anatomists the lip, but wrongly; since it is not single, and the two parts which compose it have lateral motion like the others. All these jaws are articulated under the thorax, anteriorly with respect to the feet, of which they seem to continue the series in front; and each of them has, on the inner side of its root, a membranous plate, which, slipping under the lateral border of the thorax, between the anterior branchiæ, serves to separate their lobes, and to compress them in the act of respiration. The feet have similar laminae for the posterior branchiæ, but they are deficient in those species which have the branchiæ under the tail, as the squilla. (Fab.)

These jaws, with the exception perhaps of the one or two most interior parts, are formed of two divisions; of one, which may properly be called the jaw, and another, which is its dorsal palpus or feeler. The latter is more elongated, and terminates in an articulated and pointed thread: the other has at its end, but in the two first pairs only, a feeler which does not end in a pointed bristle like the other. This arrangement is common to the crab, lobster, cray-fish, hermit crab, and, in general, to all the crustacea decapoda of Latreille. In the first the outer jaw is flattened, and joined so well to the corresponding piece and to its feeler, that the four pieces together form a kind of shield, which covers all the other jaws. But in the lobster and cray-fish the outer jaw is prismatic and strong; and the divisions of the feeler being nearly as large as the body of the jaw, the whole together resembles a foot, and has often been described as such by the ancient naturalists.

In the crustacea decapoda, the second jaw, reckoning from the outer one, resembles the first, whatever may be its form, except that it is smaller, and that its inner edge is extenuated and ciliated, instead of being denticulated. The body of the third is divided into two lobes, the fourth into four, and the fifth into two; all these three are thin and ciliated. The palpi of the two latter have generally a simple point instead of a thread. The sixth is merely a small, oval, membranous plate, without cilia or palpus. Some varieties are observed in the number and figure of the jaws in the crustacea. Thus, among the decapoda, the scyllarus (Fab.) has no thread-like process on the dorsal piece of the two first jaws; the third is undivided, and the fourth only divided into two without a dorsal piece in either. The fifth and last is the usual small oval plate. Among the branchiopoda there are still more remarkable differences: in the squilla (Fab.) the two first jaws are extremely slender and elongated, have the form of feet, and are terminated by a dilated rounded articulation, and a moveable hook. They really perform the office of feet, and not of jaws, and have no dorsal palpi. The third is a long plate, with three notches on its inner edge. The fourth is bifid; its inner lobe is ciliated; the external is pointed, and has on its dorsal surface a small oval palpus of a single articulation. The fifth and last is a simple plate.

Notwithstanding all these varieties, it is still true that all the crustacea have many pairs of jaws, very different from each other in their functions; and that these organs must act on the food, and prepare it for the proper mastication in a peculiar manner. In fact, over all these organs are found the true mandibles, which are very strong in all the genera. The triturating part varies in form. In the lobster and cray-fish there is on the inside a blunt and truly molar surface, and on the outside a cutting edge divided into three rounded denticulations. In the hermit crab the denticulations are pointed and separate. In the crab there is a continuous cutting edge. The scyllarus (Fab.) has two separate denticulations; a pointed one in front, and a blunt one behind.

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The structure of the mandible is the most singular in the squilla. It is divided into two parts; an anterior one concealed under the lip, directed according to the axis of the body, pointed, and having two rows of small denticulations; a posterior transverse one, with the cutting edge directed from below upwards, and possessing a row of stronger denticulations. All these mandibles have feelers: they are composed of three articulations, and dilated at the end in the lobsters, crabs, &c.; of three articulations, and pointed in the squilla; of a single piece in the scyllarus, &c.

The entomostracea vary still more than the ordinary crustacea. The molucca crab (*monoculus polyphemus*, Linn.), has five pairs of maxillæ, short, compressed, and covered with small spines; each possessing a very large palpus like a foot, with four articulations, terminated by a pincer like that of the fore-feet of the crab and lobster. The pincers of the first pair are very large in the male. Those of the last are small, and accompanied by some scaly laminæ. In front of these maxillæ is the upper lip, of a prismatic figure, having two palpi composed of two pieces, and terminated by pincers. The lower lip is behind the last pair of maxillæ, and is formed of two denticulated plates. The *monoculus apus* has two strong and toothed mandibles, then two pairs of small maxillæ without palpi, and lastly twenty-six other pairs of broad plates resembling maxillæ by their bases, and branchiæ in the rest of their extent, and of which the first has four palpi resembling articulated bristles: three of these are very long, and have been taken by some for antennæ. These twenty-six pairs of plates occupy nearly the whole under surface of the body.

The smaller entomostracea have been very little examined in respect to the organs of the mouth. The family of the onisci resembles the crustacea in the multiplicity of their jaws, as by their four antennæ; perhaps it ought even to be entirely associated to them. The first pair, which has also been called the lower lip, although it is clearly divided into two halves, is plane, and covers all the others: it has a very small feeler on its external angle. Next to this come two or three thin oblong pairs, of which the second is denticulated at its end: these have no palpi. The mandible is strong, denticulated, and has a small conical feeler. These organs are exceedingly diminished in the parasitic species, as in the cymothoæ (Fab.), which have only two pairs of maxillæ, like small scales, small, conical, obtuse mandibles without teeth, and in the middle of the whole a small conical tongue. The *pyncogonum ceti* (Fab.) has no visible jaws, although we can still discern two articulated palpi. The proper place of these, as well as of the other pyncogona, cannot at present be assigned. But some parasitic insects, which have been arranged among the entomostracea, do not belong to that class, and have a sucker, like fleas. Such are the numerous calygi (Cuvier) found on the gills of fishes, &c.

Muscles of the Jaws.—The mandible is moved on the chest by two muscles. One strong and long approximates its loose edge to that of the opposite side, and at the same time elevates it. It is fixed by two distinct fleshy portions to the membrane which covers the thorax interiorly above and on the sides of the stomach. One of these pieces is anterior and smaller: it is composed of short radiated fibres, terminating in a slender bony tendon, articulated to the tendon of the first portion, of which it appears to be an angular production. The largest portion is less oblique; it is situated between the liver and stomach: its fibres, more numerous and also radiated, terminate at the extremity and front edge of the common bony tendon, which is itself fixed to the middle of the loose edge of the mandible, which it tends to elevate by drawing it towards that of the opposite side.

The other muscle is inserted in a particular eminence near the middle of the opposite or fixed edge. Its fibres are short and numerous. They pass downwards and backwards, and are fixed towards the middle line of the bony case of the chest. Their contraction will produce a contrary effect to that of the preceding muscle; that is to say, it will draw the edge of the mandible away from that of the opposite side.

There appear to be two other muscles in the crab, having the same functions; but they are situated at the articulated extremity of the mandible. Each articulation of the feeler contains two muscles, a flexor and an extensor; of which the former is the largest. The flexor is placed in the broadest part of the concavity of the mandible: it is inserted in a small bony tendon situated at the anterior edge of the articulation. The extensor is more slender, and attached to the fixed edge of the mandible; it is attached by a long and slender tendon to the posterior edge of the articulation of the first piece. The muscles of the two other pieces of the feeler are arranged nearly in the same manner.

The maxillæ are moved from within outwards, and reciprocally, by muscles analogous to those which we have just described as belonging to the mandibles; and the pieces which compose them, when they consist of several articulations, contain in their interior two muscles, an extensor and a flexor, very similar to those of the legs.

Moreover, each of the maxillæ, and particularly of the lower ones, has, on the piece corresponding to the lip in the legs, one, two, and sometimes three laminæ directed interiorly to the cavity of the branchiæ; these will be considered in the account of respiration.

Jaws of Insects.—1st. *In the Gnathoptera* (Cuvier.)—This order observes no common law, like all those which are founded on negative characters only; it must be divided into families, in order to obtain some general rules. The first, that of the millepedes, affords none; for the iuli have only small mandibles, under which is a conical piece composed apparently of the lower lip and the maxillæ consolidated together, without any feeler. The scolopendræ have small mandibles, larger maxillæ without palpi, a pair of palpi under them, and a large lower lip, of which the articulated and pointed palpi form together a strong pincer. The second family, or the arachnidæ, has strong mandibles which cannot cut, but are armed at their extremity with a moveable hook, often forming a pincer, with a prominence of the body perforated for sucking. The maxillæ are scarcely visible, and only serve to support palpi, which are always very long, and in the form of feet, and sometimes enormous, as in the scorpions, where they resemble the claws of crabs. In the phrynes, where they furnish the animal with a formidable weapon, there is neither lower lip nor labial palpi. We might contest the propriety of calling these organs mandibles, since they serve for sucking and not for masticating; but their position, and the analogy of other insects, forbid us to refuse them this name. Fabricius has founded the character of his class of unogata on the small moveable hook which terminates them.

The third family, that of the rieini, or fleas of birds, has only mandibles, between which is a small rostrum, and appears to have neither maxillæ nor lips. Those of the lepidema and podura have not been sufficiently examined.

2dly. *In the Neuroptera.*—This order is not much more constant than the preceding in the forms of the mouths of the insects belonging to it. We meet first with the beautiful family of the agnatha, insects destined to live scarcely a few instants in the perfect state, and possessing merely what is necessary for copulation and laying. They have no occa-

tion

sion for eating, and possess only an imperfect mouth, without any mandible, and with membranous maxillæ attached to the whole length of the lower lip.

The family of the *odonata*, or libellulæ, which are the most strongly armed, and the most cruel of insects, is of a nature quite opposite to these. Their mandibles have an anterior, hooked, and, as it were, cutting portion, and a posterior truly molar surface, with four pointed tubercles. It is curious to observe in these insectivorous insects the same characters as in the quadrupeds which are nourished by similar food. The maxillæ are divided into long pointed denticulations like needles, and have palpi without articulations. An enormous lower lip covers all this apparatus; it is divided into three or four lobes, of which the lateral ones are themselves sometimes terminated in the form of pincers.

The other *neuroptera* are less distinctly characterized. They have, in general, stronger or weaker mandibles; maxillæ with articulated palpi, which are two in number for each maxilla in the myrmeleon and the *asaphus*, and solitary in the others; a lower lip, terminated by a tongue, which is simple in most kinds, divided into four in the *termes* and *pocus*, having two very large and club-shaped articulated palpi in the myrmeleon; and no particular characters in the other genera.

The most curious mouth, in this order of insects, is that of the *panorpa*. Its mandibles are small, and placed at the end of a long snout; of which the under part is filled by a lip, and very elongated maxillæ consolidated together. Here the subdivision of the lip commences, into the horny piece (*ganache* of Latreille) at the basis, which supports the labial palpi, and the tongue, or membranous organ, placed at the extremity between the labial palpi.

3dly. *In the Hymenoptera*.—This natural family, the most interesting of the insect tribe, by the numerous and varied instincts with which the different species are endowed, has, in the structure of its mouth, a character of which the first appearance has just been indicated in the *panorpa*. Part of the basis of the maxillæ, and the horny portion of the lower lip (the *ganache*), are there united by a membrane, and are always moved together. The portion of the jaw beyond the feeler covers the tongue more or less, and serves it for a sheath, which is sometimes very complete.

The *hymenoptera*, which suck the nectar of flowers, may be recognized by the prolongation of their maxillæ and lower lip, which are often much longer than the head, but admit of being folded up so as to be withdrawn under the production of the mandibles. This kind of organ is sometimes placed on a pedicle, which admits of being moved backwards and forwards. This may be seen in the bee and the neighbouring genera. In these elongated trunks the tongue forms the essential part, the true sucking tube: but it is always only rolled so as to form a half tube, and opens longitudinally below.

In the bee, one of the articulations of the labial palpi is prolonged, and forms the first sheath of the tongue; the outer portion of the jaw is prolonged in a similar way to form a second sheath; Fabricius calls this structure *lingua quinquedens*. In the *Eucera* (Fabr.) two scales of the basis of the tongue, which are clearly seen in the bee, where they are very small, are prolonged as much as the tongue, and the organ is therefore a *lingua septendens*. In other genera the labial palpi do not serve for sheaths, and the trunk is therefore trifid, as in the *sphex arenaria*, &c. Even where the tongue is not prolonged into a trunk, it is always opened below; and this is a character peculiar to the *hymenoptera*, whence it results that their mandibles

assist them but little in procuring their food, but serve them merely as armour, and as instruments for working. What they might chew would arrive with difficulty at the under surface of the tongue to be swallowed; but the latter organ imbibes nutritious matter in the liquid form, or in a state of minute division, as the pollen of plants, &c. These genera with short tongues present very interesting differences in the form of the organ. It is sometimes simple and conical, as in the *evania*, or formed like an oval spoon, as in the *firex*, the *mutilla*, and the hornet, or dilated and grooved, as in the *leucopis*, or divided into three pieces, as in the *tenthredo*, or into three conical and villous bristles, as in the *scolia*, or more or less equally and deeply divided into three or four lobes, as in the *vespa*, and most of the genera separated from that of *sphex*, &c. These different configurations determine the kind of food which the animal employs, and the situations in which it procures it. The differences of the maxilla are less important: it forms in front merely a scaly piece, covering the tongue above, and having its length proportioned to that of the tongue.

The palpi vary more in their absolute and relative length, in the form and number of their articulations. The bee has exceedingly small maxillary palpi. The same may be said of the *firex*, but the labial palpi are here large and club-shaped. Most others have them filiform or setaceous, and with several joints. The upper lips sometimes assumes a peculiar form for a particular office. In the leaf-cutting bees, for example, it forms a scaly shield, protecting the trunk, upon which it is folded back, that it may not be injured by the edge of the leaf which the mandibles cut.

4thly. *In the Coleoptera*.—These, although they are excessively numerous, form a natural order. Their lower lip is not placed between the maxillæ, as in the preceding order, but really below, so as to conceal a part of them, when the mouth is observed from below; consequently they are articulated between the lip and the mandibles, and not suspended with the lip in a common membrane, as is the case in the *hymenoptera*. The opening of the pharynx is also formed upon the tongue, and not below it, as in the *hymenoptera*, so that the produce of mastication takes that direction naturally. Such are the true characters of the mouth in this order; but that of having the maxilla free from adhesion to the lip is not exclusive, as Fabricius seems to have supposed, when he founded on this idea the name of *eleutherata*, which he has given to these insects.

There seems to be only one family in this order, of which the character is determined in a striking manner by the organization of its mouth; it is that of the *carnivora*. All of these have prominent mandibles and maxillæ, which are also hooked and cutting, four maxillary and two labial palpi; consequently they are terrible enemies to other insects. The chief circumstance, by which they are distinguished from each other, is the figure of the horny and membranous part of the tongue, which are more or less lobed: they may also differ in some unimportant accessory, as the spines of the maxillæ, &c.

Another family, as natural as the preceding in all the circumstances of its external and internal organization, that of the *lamellicornia*, possesses scarcely any common characters in the parts of the mouth. Some have enormous projecting mandibles, more or less resembling the horns of the stag (*ucanus*); others have only short but strong mandibles (the dung-beetles, *geotrupes* of Latreille); in others they are membranous and scarcely visible (the *cetonix*, Fabr. the *scarabæi*, the *copris*.)

Some have strong maxillæ well furnished with teeth (the *melolonthæ*,

melolonthæ, Fabr.) ; others have them simply ciliated (the *cetonizæ*), or in the form of a pencil (the *lucani*.)

The same variations take place in the lips and palpi, and are not merely observed between the different genera. For, although great pains have been taken to subdivide this family into numerous genera, none of these arrangements are founded on a perfectly similar conformation of the mouth. Nothing can prove more clearly the impracticability of the project, so resolutely persisted in for thirty years by M. Fabricius, of establishing a method of insectology on the conformation of the mouth only.

A third natural family of the coleoptera, that of the rostricornia, is characterized by having its mouth at the end of a long snout. Such of the others as are well determined, for example, the herbivora, the lignivora, &c. have no striking character common to all the genera, although there is a certain resemblance.

The different configurations of the palpi, of the horny and membranous portions of the tongue, of the maxillæ, &c. have been carefully described by naturalists ; but their labours have not hitherto furnished any general remarks which suit our present purpose.

5thly. *In the Orthoptera*.—This order is very uniform in the structure of the mouth ; it possesses always strong mandibles and maxillæ, under which is the lower lip. A moveable upper lip covers the mandibles more or less completely. The maxillæ are strongly denticulated, and have always an articulated feeler, and another not articulated, which sometimes grows so broad as to cover and protect the maxillæ, whence it has been called galea : but often it is as slender as a thread. The lower lip has always two articulated palpi, between which is a more or less divided tongue. The pharynx opens upon the tongue, as in the coleoptera, not under, as in the hymenoptera ; so that these insects are true masticators : the principal differences of the genera are founded on the division of the part called the tongue, and on the equality or inequality of the portions. Thus, in the mantis there are four, pointed and equal : in the phasma the two middle ones are much the shortest. The *achetæ*, *locustæ*, and *acridia* of Fabricius, have the two outer ones broad and rounded ; and the intermediate one short and pointed. The *blattæ* and the *forficulæ* have two oblong ones ; the *truxalides* (Fabr.) the *grylli*, and the *pneumoxæ*, have only two rounded ones, &c.

6thly. *In the Larvæ of Insects*.—These organs are not distributed in the larvæ, as in the perfect insects : many larvæ with jaws produce perfect insects, which have none, such are all those of the papilio, and several of the diptera. Different larvæ have often similar jaws when the insects produced from them have very different ones ; as in the whole family of the lamellicornia.

The larvæ of insects which go through an incomplete metamorphosis, have the same kind of mouth as the perfect insects, with the exception of some modifications in the proportions of parts ; thus the mouth of all the orthoptera is the same in the three states. The change of proportions just mentioned produces the most sensible effects in the neuroptera odonata or the libellulæ. Their mandibles and maxillæ are the same in the larva as in the perfect state. Their lower lip presents also the same divisions, but it is placed on a very long pedicle, with an angular turn or elbow in its middle, so that it remains commonly in its natural position under the maxillæ, but the animal can, by straightening the curved pedicle, carry it suddenly considerably forwards : and, as the notches which terminate it will serve the purpose of pincers, they are employed for seizing the

small insects which come within reach. When the libellula has its wings, it no longer needs such an artifice : its lip is shortened, and confined to the ordinary functions.

The larvæ of the hymenoptera have very simple organs of mastication, consisting principally of small, short, and strong mandibles. The mouth of the larvæ of the coleoptera has the same parts as that of the insects ; but they are differently shaped. Thus the *lucani*, which in the perfect state have such enormous mandibles, and such peculiar pencil-shaped maxillæ, have, while larvæ, a nearly orbicular upper lip, immediately articulated with the front ; short, strong, thick, pointed mandibles, slightly arched externally and on the inner side ; towards their loose extremities they have three denticulations on one plane, and towards their bases a striated and plane molar surface : it is plain that these are in their mouth instruments for cutting and chewing wood. The maxillæ are terminated by two small hooks, of which one is moveable, a very singular structure, and support a feeler of four articulations. The lower lip is broad, and in a manner truncated, and has two palpi ; each composed of two pieces.

The *scarabæi* differ remarkably from the *lucani* in their mouth ; but the two genera agree almost entirely in the mouths of the larvæ ; the same observation may be made of the *melolonthæ* and *cetonizæ*, which are also very different from each other.

This small moveable hook may be considered as a second maxillary feeler ; these larvæ would then have six, while their perfect insects have only four. We must observe also, that the larvæ, both of the *lucani* and of the *scarabæi*, have two strong teeth on the upper surface of the lower lip near the pharynx.

The *prioni* (Fabr.) which have elongated mandibles like the *lucani*, have nothing of this kind in the larva state. There is a very large upper lip, lobated, rounded, villous, supported by a membranous lamina, then two strong, curved, cutting mandibles, furnished at their bases with two conical palpi, of which the rings enter one into the other, like the tubes of a telescope, and which are probably the rudiments of antennæ. A soft mass, consisting of three lobes placed behind the mandibles, represents, by its middle lobe, the lower lip with two very short rudiments of labial palpi, and, by each of the lateral lobes, the maxillæ properly so called with its proper palpi, composed of four conical articulations, of which the last is the smallest.

On the contrary, the *dytisci*, which have very slightly prominent mandibles, have them very long in the larva state. They represent two sharp hooks, perforated at the extremities, which serve for sucking. There are no visible maxillæ, but merely two long filiform palpi of five pieces ; while the perfect insect has four maxillary palpi. This is exactly the reverse of what we have just seen in the lamellicornia. Instead of the lower lip there are two tubercles, each of which supports a feeler of two pieces. The larva of the *hydrophilus* also wants the maxilla, but has four palpi ; the mandibles are short, cutting, and not perforated.

Of all larvæ, those of the lepidoptera differ the most widely from the perfect insects in respect to the mouth ; and, what is very singular, their mouth is constructed on the plan of that in insects with jaws, although it possesses no trace of these parts in the butterflies. Under a semi-orbicular upper lip, and under two strong, cutting, denticulated maxillæ, are three tubercles representing the lower lip and the maxillæ ; the latter seem composed of pieces, which enter more or less one into the other, and terminate by two small tubercles, of which the internal, armed with two
stiff

stiff bristles or teeth, is the maxilla properly so called; the other is the feeler. The lower lip has two very small palpi, and a hollow point in the middle: this is the spinning hole, through which the silk comes out, employed by the caterpillar for forming its cocoon.

The Muscles.—When the upper lip is moveable, it is drawn backwards by two bundles of fleshy fibres situated within the cranium, and which are themselves divided into two planes. The motions of the mandibles are analogous to those of the hips in insects. At the basis, on the side corresponding to their convexity, there is a kind of condyle, or convex rounded eminence, received into a small cotyloid cavity, excavated in the temporal scale in front of, or below the eye. On the side corresponding to the cutting edge of the mandible, there is commonly observed, at least in large insects, such as the scarabæus monoceros, the prionus, the capricorne (cerambyx), the lucanus cervus, the locusta, a kind of solid tendinous plate, which is apparently prolonged into the interior of the solid parietes, and affords attachment to muscular fibres implanted in it laterally, as the barbs of a feather are on the common shaft. These muscles approximate the jaws to each other, or shut the mouth. Those which separate the mandibles and open the mouth are much shorter, and not one-tenth of the size of the preceding. They are inserted in a small apophysis, corresponding to the convex external line of the mandible, on the outside of the condyle. Lyonet has described and figured these muscles in the larva of the phalæna cossus. He calls them adductors and abductors; but he has regarded as so many distinct organs, the fasciculi of fibres inserted into the common tendon; so that he has distinguished nearly eleven muscles or bundles destined to close the mouth, and three principal planes for the purpose of opening it. These fibrous planes are found in all other insects; but very great varieties are observed in their number and relative disposition. These differences depend evidently in the first place on the very different insertions of the tendinous plates, which are to be considered as prolongations of the muscles: they seem also to be modified by the length and size of these plates. The latter always have a relation to the form and extent which the internal parietes of the mandible and of the cranium afford for their insertion.

Salivary Organs.—No express organ, for the purpose of supplying a salivary secretion, has been hitherto discovered in the crustacea; but the place of salivary fluids is supplied in the following manner. The branchiæ, placed at the sides of the body, under the edges of the corselet, are compressed and agitated by the cartilaginous plates connected to the jaws and feet; at this time, the water in contact with the branchiæ flows along these plates, and comes out at the two sides of the mouth; hence, when a crab or lobster is taken out of the water, much froth is observed to issue from that part. This water, although foreign to the body, may serve to moisten the food, when the animal eats out of water. At other times no saliva can be needed, as in the cetacea and fishes.

Many insects furnish, during mastication, more or less fluid, which is often acrid, and of a penetrating odour, and supplies the place of saliva. In the carabi it is black and fœtid, very corrosive in some grylli; and capable, in the larva of the cossus, of softening and dissolving the wood of the willow, on which the animal feeds.

The sources of these fluids are not yet known in all species; probably, however, they are produced by organs analogous to each other, and those of one species may serve as an example of the rest. The larva of the cossus has two long spongy vessels, like all the secretory organs of insects, very

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much convoluted, and opening into a large reservoir, which communicates with the mouth by a small canal. This organ seems to produce a liquor, necessary to the animal for the purpose of acting on the wood by which it is nourished. It is deficient, or very small in most other caterpillars.

Organs of Deglutition.—1st. In insects with jaws. The membranous extremity of the lower lip, in the coleoptera, and the orthoptera, which has been called a tongue, scarcely deserves that name. But in the second of these families there is a real fleshy tongue, loose only at its point, and analogous in figure to that of quadrupeds. The odonata, among the neuroptera, have a structure somewhat similar; but the tongue of the hymenoptera is only a membranous tube, often open below, and forming the extremity of the lower lip. In the wasps, and in all the hymenoptera, which have no trunk, it has an arched form, being open and concave below, and more or less divided into pieces. The bees, and all the hymenoptera which have a long trunk, possess a complete tube with annular fibres: suction is performed by the successive contraction of these fibres.

2dly. In insects without jaws. Since deglutition is the first act of nutrition in these insects, the form of the organ employed in suction determines the species of juice which the animal can imbibe, and consequently influences very considerably its way of life. The relations of the natural families of these animals to their organs of suction, are much more constant than they are to the instruments of mastication in the other half of the class. There are four orders of insects without jaws, viz. hemiptera, lepidoptera, diptera, aptera; and there are three kinds of suction particularly belonging to the three first of these. The hemiptera have a stiff proboscis enveloped in a sheath; the lepidoptera a membranous trunk spirally convoluted; the diptera a trunk terminated by two fleshy lips. Hence the names of rhyngota, glossata, and antliata applied by Fabricius to these three orders; which he has preserved the same as in the Linnean arrangement, and which many others had adopted before.

The greatest varieties are observed in the diptera. In this order the organ consists essentially of a fleshy trunk, divided below into two lips more or less prolonged, and capable of being applied to the object which is to be sucked: two tentacula are detached to the root of this trunk. Between the latter is a pointed scale, sometimes employed to cut the vessels from which the fluid is to be sucked, but often serving only to cover other pieces, which are much sharper and more appropriate to this function. In the stratiomys, and the common flies, there is merely a single short point under the scale. The syrphi and rhingia have in addition a stiff bristle under each palpus. In the rhagio there are three bristles under the scale, and the middle of them is the strongest. The tabani have four, all pointed and sharp like the blades of lancets; hence these insects have the power of inflicting the severest wounds on the skin. All the parts are much elongated in the genera empis and bombylius; the trunk is more particularly extended than the bristles in the latter, which indeed have only one bristle under the scale. In the empis all the parts are equally prolonged, and there are four bristles.

In the myopa (conops, Linn.) the trunk is elongated into a slender tube with an angle at its middle; there is a short scale without any bristle. In the asilus and stomoxys (conops, Linn.) the trunk is hardened, and assumes a horny texture, so that it is capable of cutting. There is a single bristle within it in the stomoxys, and three in the asilus. The trunk is reduced almost to nothing in the hippobosca; and the single bristle is long and flexible.

Z

All

All these genera have palpi of a single piece. The tipulæ and culices have them articulated, and often very long; the trunk of the tipulæ is short, with large lips, and no bristle; that of the culices is long, slender, and contains a fine bristle.

In the æstri, all the external organs of the mouth are withdrawn within the head, so as to expose externally only three rather prominent points.

The hemiptera (rhyngota, Fabr.) are more uniform in the structure of these parts than the diptera; in general they have a tube composed of some articulated pieces, and open above in its whole length. This tube contains three fine bristles nearly as long as itself; it exhibits scarcely any other varieties except in its position and inflexions.

The lepidoptera (glossata, Fabr.) are equally uniform in the structure of these parts: their tongue is formed of two membranous plates, curved transversely in their whole length, so as to form a tube, and, when the insect does not employ it, convoluted spirally, and lodged between two flat villous palpi, composed commonly of three pieces. The differences depend on the variable length of this organ, which is sometimes very inconsiderable, and on the figure of the palpi: they are not of importance in connection with our present subject.

Among the aptera, the louse has only a simple and short sucker, inclosed in a small prominence: the flea has one with two bristles, inclosed in a sheath of three pieces, opened longitudinally above.

Intestinal Canal.—It is straight in the crustacea, and uniform in its size, with the exception of the stomach. The latter is very different in the crustacea decapoda, and in the branchiopoda, it possesses, in the former, a singularity of structure, which is remarkable as the only example of the kind in the whole animal kingdom; that is, it is supported by a bony apparatus, a species of skeleton, and consequently does not collapse when empty. The destination of this apparatus is not less extraordinary than its existence; it serves to support five hard and moveable teeth, which perform in the cavity of the stomach a true mastication. They are placed before the pylorus, and allow no substances to pass through that opening until they are perfectly triturated.

The stomach is found in the thorax above the mouth, and the œsophagus communicates with it by a large aperture. The anterior portion is more capacious than the posterior, and the teeth are placed where the cavity begins to grow narrower. On the superior surface, or that which is opposed to the mouth, there is a thin transverse plate occupying the middle of the stomach. This supports the first tooth or bony oblong plate, consolidated to the superior surface of the stomach, directed towards the pylorus, and terminating behind in a tubercle.

On this posterior extremity is articulated a second plate, directed backwards, bifurcated like the letter Y; and on each of its lateral divisions another is articulated, which turns forwards and outwards, and reaches the lateral extremity of the first transverse plate. The two largest teeth are fixed on these two lateral pieces. They are oblong, have flat crowns, which are grooved transversely, and the grooves and inequalities vary in the different species. In the cancer pagurus of Linnæus, the crown is finely striated, has large denticuli at its lower edge, and a prominent part in front which is not striated. In the lobster there are nine transverse ribs, of which the three front are much the largest.

From the point of union of the transverse portion with the lateral of each side, another lateral piece is continued, proceeding lower than the first, and having at its extremity

a lateral tooth smaller than the preceding, placed rather before and below its anterior extremity, and having three and sometimes even five small, sharp, and bent points. The two small teeth with curved points seize the nourishment which comes from the mouth; they convey it between the two teeth with flat crowns, which bruise it between each other and against the first single plate.

When it has undergone this operation, the aliment passes through the narrow part of the stomach, where its course is still interrupted, first by a fleshy oval prominence corresponding to the interval of the two large lateral teeth, and afterwards by a sharp crista, which divides the pylorus into two half canals.

There are muscular fibres in this stomach, which approximate the bony pieces, and the teeth which they support: there are exterior muscles which separate the teeth from each other, and are attached to the neighbouring, and particularly the lower parts of the thorax. These muscles must be subject to the will, which is another remarkable singularity belonging to these stomachs.

These teeth are discharged from the stomach when the old shell is shed; and are supplied by new ones.

After this large stomach, which is always dilated, comes a very slender intestine, which takes a straight course to its termination at the end of the tail. Towards its middle a thick ring is observed, on the inside of which there is a strong valve, and the commencement of a very long cæcum.

These circumstances have been ascertained in those cancers which have long tails, as the cray-fish and the lobster, also in the parasitical species (the hermit crab), and in the crabs, as the cancer pagurus, puber, and mænas: the structure may therefore be considered as common to all the crustacea decapoda. The branchiopoda possess a small membranous stomach, shaped like a triangular prism, furnished on each side of its posterior extremity with a row of small pointed teeth, and followed by a very thin intestinal canal, continued from one end of the body to the other, and nearly uniform in size throughout.

In the onisci the front of the canal is a little swollen compared to the continuation.

In the rest of the class of insects we find as many varieties in the structure of the alimentary canal, as in all the classes of vertebral animals together. There are not only differences between the families and species, but often very considerable ones between the larva and perfect states of the same insect: and all these varieties bear a very accurate relation, which in many cases can be very clearly appreciated to the animal's kind of life, whether of shorter or longer duration. Thus the voracious larvæ of the scarabæi and butterflies have intestines ten times as large as the winged and sober insects, if we may be allowed to use that term, to which they give birth.

There are the same general resemblances in the natural families of insects, as in the rest of the animal kingdom; thus all the coleoptera lamellicornia, all the carnivora have similar intestines in each of their states, &c. Here, as in the other classes, the length and complication of the intestinal canal indicate a vegetable nourishment; shortness and thinness, on the contrary, shew that the animal is carnivorous, &c.

I. *In the Coleoptera.*—We shall select for description some very natural families, which are remarkable for any peculiarities of structure, and shall notice together the intestinal canal of the larva and of the perfect insect, in order to exhibit in the clearest view the very striking difference between these two states.

1. In the coleoptera lamellicornia. The last mentioned point

point is very clearly exemplified in this family. The larvæ of all the genera, which compose it, have a large and short alimentary canal, divided into the following parts. 1. A short and weak œsophagus. 2. A straight cylindrical stomach, tolerably thick and muscular, surrounded by three circles of small cæca, placed, one at the commencement, one at the middle, and the third at the end of the cylinder. These cæca are numerous, weak, and short: those of the third circle are ramified in the larvæ of the scarabæi properly so called (les géotrupes of Latreille). In the melolonthæ the cæca of the first circle have small lateral denticulations, which may be regarded as so many smaller cæca. The upper and lower circle in the lucani are composed of a small number of large cæca, while the middle is made up of very numerous small ones. Probably they all secrete and pour into the stomach some dissolving fluid. 3. A short intestine of much thinner sides, and rather shorter in length than the stomach. Its origin, which is rather expanded, receives above the hepatic vessels; it terminates at the posterior extremity of the body of the larva. 4. An enormous colon, or large intestine, three times as large as the stomach, and filling all the posterior third of the body. It possesses two smooth bands, between which are transverse folds, producing a cellular appearance like that of the human colon. Its course is in a direction contrary to that of the small intestine; that is, it returns from behind forwards, and lies upon that intestine. 5. A rectum turning from before backwards upon the colon, in order to terminate at the anus. It is slender and straight, without any inequality.

We should have expected that the perfect insect would retain some trace of such strongly marked peculiarities; yet there is really no vestige of them discernible. All these insects, lucani, scarabæi, melolonthæ, cetonix, have a long slender canal, four or five times longer than the body, very much convoluted, and possessing hardly any dilatation. Sometimes the anterior portion is merely a little larger and folded transversely.

2. In the coleoptera carnivora. As the habits of these animals are very different from those of the preceding, their alimentary canal is different in both states. In the perfect state it consists, of, 1st, a long and very dilatate œsophagus. 2. A first stomach, nearly spherical in its shape, with muscular parietes and transverse wrinkles. 3. A second stomach, membranous, elongated, and villous; not on the inside, as those of certain vertebral animals are, but on the outside. The villi are vessels which draw, from the surrounding nutrient fluid, the gastric juice which they pour into the stomach, according to the laws of secretion in insects; considered as animals which have no circulating organs. 4. An intestine of moderate length, between once and twice the length of the body, small and uniform in its diameter throughout. 5. A conical and rather long cæcum inserted near the anus. Near the margin of the anus are found two vesicles, which secrete the acrid fluid almost constantly voided by these animals when they are seized.

Such is the structure of the genera separated from the carabi, the cicindelæ, and the dytisci: their larvæ have no dilatation like a stomach; their canal is small, all of one size from the mouth to the anus, and about one-half longer than the body. A cæcum, however, may be observed near the anus in the larvæ of the dytisci.

3. In the coleoptera clavicornia. The hydrophilus piceus, in its perfect state, has very long cylindrical intestines (four or five times longer than the body), uniform in size throughout, and forming large convolutions in the abdomen. The larva, which is much more carnivorous, has short intestines (half as long again as the body), of which

nearly two-thirds form an elongated stomach, villous externally; the rest is smooth, and divided by a contraction into two parts. The filphæ, on the contrary, have in their perfect state such a stomach, followed by a small intestine twice as long as the body.

4. In the coleoptera lignivora. The larvæ of the prioni and cerambyces have very large intestines, with their sides nearly uniform throughout, and forming four folds, each of which is as long as the body. The commencement, which alone can be compared to a stomach, is rather corrugated transversely like a colon. The perfect insect has first a membranous and round stomach, then an oval one, which is infensibly contracted into a cylindrical canal, suddenly growing smaller at the insertion of the hepatic vessels, and continuing so to the anus. The whole canal is at most twice as long as the body.

The larva of the lamia, Fab. has first a very distinct stomach, then a knotted small intestine, which is suddenly changed into a large intestine longer than itself.

5. In the coleoptera filicornia, of the family of the vesicantæ, the meloe possesses an enormous oval stomach, filling nearly the whole abdomen. The front is covered with strong circular fibres; and a cylindrical valve, analogous to the valvula coli of man, is observed at the cordia.

In the family of the lacifuga, the tenebrio has a cylindrical elongated stomach, a first intestine, which is rather slender, and another somewhat larger. The whole canal is about three times the length of the body. The blaps has a muscular cylindrical stomach, another equally large but membranous, separated from the former by a slight constriction, and a small intestine which is a little enlarged towards the anus. The proportionate length of the whole is about the same as in the last instance.

6. The brachelytra, or staphylini, resemble the carnivora in the villosity of the stomach, as they do in their habits.

II. In the Orthoptera.—These, in the class of insects, seem analogous to the ruminants among the quadrupeds, at least in respect to the complication of the stomach, and some suppose that their aliment may be seen brought back into the mouth for the purpose of a second mastication. As they undergo an imperfect metamorphosis, their alimentary canal is the same in the larva as in the perfect state. It consists in general of the following parts. 1. An œsophagus of the usual kind. 2. A first membranous stomach. In most genera this is a simple dilatation of the œsophagus, of which the internal membrane is smooth and folded longitudinally. In the locusta it is rather, and in the blatta considerably larger than in the other genera. In the acheta it is an oval bag, having quite a lateral position, connected to the side of the œsophagus like a cæcum, with one opening for the reception and discharge of its contents. 3. A second stomach or gizzard, small, nearly round, possessing a very thick muscular coat, and armed internally with scales or teeth. In the locusta and acheta these are longitudinal rows of fine and numerous scales, placed one over the other like the tiles of a roof, and directed backwards. In the blatta there is a single row of six or eight large curved teeth, denticulated like the bills of birds of prey, and directed backwards. 4. The cæca or third stomachs are immediately round the posterior orifice of the gizzard, and vary in number. The locusta and acheta have two large ones, and this has given rise to the remark that the grylli have four stomachs like the ruminating mammalia. The internal membrane is much folded, and its extremity receives many small secretory vessels, which pour out gastric juice. There are five of these cæca in the gryllus, and eight or ten in the blatta. 5. The intestinal canal varying in length and diameter.

The earwig is said to be very different from the other orthoptera in having only a simple elongated stomach, a very short intestine, and a dilatation with longitudinal folds near the anus.

III. *In the Hymenoptera.*—The bees have a first stomach, which is membranous and transparent, pointed in front, large and divided into two portions behind. In this organ the nectar of the flowers is converted into honey: it is the reservoir of this matter, which they deposit in their hives by the act of vomiting. The second stomach proceeds from the interval of the two divisions; it is elongated and swollen laterally towards the middle. The hepatic vessels are inserted immediately after the pylorus. The first intestine is small, and scarcely equal in length to the second stomach: the rectum is large but still shorter.

The first stomach of the wasp is smaller; the second longer, and particularly much more muscular. The larvæ of both genera have an immense cylindrical muscular stomach, filling nearly the whole abdomen, and followed by a very short intestine.

In the sphex the structure resembles that of the bee; the parts are only larger in proportion to their length.

IV. *In the Neuroptera.*—The family of the odonatæ, which is truly carnivorous, has very short intestines in its three states: they do not exceed the length of the body. In the libellula grandis, Linn. a short œsophagus is succeeded by a small oval muscular stomach, striated longitudinally; then comes a straight large intestine or second stomach, with a constriction placed far back at the entrance of the hepatic vessels. The interval between this part and the anus is very short, and folded longitudinally. In its larva, the œsophagus has a circular dilatation: the constriction of the cordia produces a kind of valve. From this point the canal has a bright yellow colour, as far as the insertion of the hepatic vessels; its last portion is white and much thicker; and contains the singular respiratory apparatus, which we shall describe afterwards.

In the family of the agnatha, the ephemera, during its larva state, has merely a straight uniform canal, without any convolution, which becomes extremely thin in the perfect insect.

V. *In the Hemiptera.*—These possess in general a simple, oval, and muscular stomach, of considerable size, followed by a small intestine of moderate length, near the end of which is a small cæcum. Such at least is the case in the nepa, notonecta, &c.

VI. *In the Lepidoptera.*—The caterpillars have a large, short, straight, intestinal canal, without any considerable inequalities. The œsophagus is the slenderest portion, the stomach is elongated and contracted at the pylorus. After the pylorus the intestine is larger than in the rest of its length; it is contracted towards the anus. At the latter part it has the strongest circular fibres; on its parietes other fibres are found, variously decussated and ending in two white lines, which extend over its whole length, one above, and the other below. The diameter varies in different situations, according as the contents are accumulated. Sometimes the distinction between the stomach and intestine can scarcely be observed.

This canal is obviously calculated for solid and abundant food. The butterfly, which subsists entirely on the juices of vegetables, has a very different digestive apparatus. Among the diurnal insects of this order, the atalanta has a slender œsophagus, with a membranous dilatation on its side, like a crop, more or less rounded in its figure, and often full of air. Then comes a second elliptical membranous stomach, the sides of which present many hemispherical cellular pro-

minences; and afterwards a third, cylindrical, and rather muscular, followed by a small intestine of moderate length, terminated by a rather larger rectum.

VII. *In the Diptera.*—In general their intestinal canal is tolerably long in both states. It is five times the length of the body in the larva of the stratiomy, and consists of a short œsophagus as slender as a thread, a very small oval stomach, and an intestine, of which the first half is wrinkled transversely, which becomes afterwards larger and smoother to the insertion of the hepatic canals, below which it is suddenly constricted and remains narrow. The differences between this and the larva of the syrphus are very slight; and the distinctions between both and their perfect insects are not more obvious. However, Swammerdam represents four small cæca, after the stomach, in the larva of a fly which inhabits cheese; Cuvier has not found them in the diptera diffested by himself.

VIII. *In the Gnathoptera.*—The scolopendræ have a long canal contracted behind; the iuli have an equally long and cylindrical one. We have already mentioned that of the oniscus.

IX. *In the Aptera without Jaws.*—The louse has two small swellings at the origin of the stomach, which is elongated; the intestine is not longer than the stomach; it is small, and terminated in front of the anus by a muscular enlargement.

Hepatic Vessels.—Although the crustacea have a heart and blood-vessels, most of them have not a liver, properly so called. The organ which produces bile in them consists of a considerable number of small tubes ending in cul-de-sacs. The structure is analogous to that of the pancreas of fishes, which consists, as we suppose, of the multitude of cæca opening at the origin of the intestine.

The appearance of the hepatic cæca in the crustacea discloses their nature and office; they are yellow, have spongy sides; produce a brown and bitter liquor, which gives its peculiar taste to the soft substance in the body of the lobster; for the hepatic cæca, with the stomach, fill nearly the whole thorax of these animals; and, in the hermit crab, they fill also a great part of the tail.

The squilla, Fab. is an exception to this rule; these animals have a liver of a firm texture, very much resembling a conglomerate gland, consisting of lobes arranged on each side of the alimentary canal in its whole length.

In the insects, properly so called, there is still less appearance of liver than in the common crustacea. Since they can have no glands on account of the absence of blood-vessels, the bile, like all the other secretions, is produced in them by fine vessels with spongy sides, floating in the fluid, which bathes all the parts, and deriving from it, by the organization of their tissue, the elements proper for the formation of this liquor.

These vessels exist equally in the larva and in the perfect insect: the fluid, which they form and contain, tinges them with its own colour. They are usually yellow, sometimes, as in the scarabæi and cerambyces, of an opaque white; and in other instances, as in the dytisci, of a deep brown. Their bitter taste arises from this fluid, which would probably be found to possess many of the qualities of bile, if it could be procured in sufficient quantity for analysis.

The number of these vessels is variable; when it is large, they are short, so that the extent of surface is nearly the same. Sometimes they all end in a common excretory tube, which terminates in the intestine. This is the case with the gryllo-talpa. They are commonly inserted after the stomach, but sometimes not till near the middle of the intestinal canal, as in the grylli; or even towards its end, as in the libellulæ. The onisci alone have them inserted near the œsophagus; in these

these insects they are only four in number, large, undulated, as long as the body, and of an orange colour.

Among the neuroptera, the libellulæ have a considerable number of short ones, surrounding the intestine at a small distance from the anus, where it becomes large. The same structure exists in the common grylli. In the gryllo-talpa there is a large packet of these vessels, terminating by a common canal in the middle of the large intestine. The larvæ and the perfect insects have the same structure in these genera. This resemblance seems moreover to exist, with respect to the hepatic organs, even in orders where the metamorphosis is the most complete in all other parts; the number at least is not changed. It is considerable in the hymenoptera, but generally amounts only to two in the coleoptera. In the latter they are generally found parallel to the intestinal canal, and make numerous windings. Their insertion is immediately after the stomach in the larvæ of the scarabæi, the dytisci, the carabi, &c.

The caterpillars and the perfect insects produced from them have two, each of which is sub-divided into three, placed in the former, at the sides of the posterior half of the canal, and forming their principal folds completely in the back of the body. Among the hemiptera, the nepæ seem to have only two. The larvæ of the stratyomys and syrphus, of the order diptera, have four, which end in the intestine by a common trunk.

Coverings and Supports of the Alimentary Canal.—We have mentioned already that the stomach of the crustacea is supported in its situation by its muscles; the remainder of the canal is maintained only by vessels, and by the compression of the surrounding parts.

In the proper insects, the intestinal canal is retained in its place by the tracheæ only; there is neither mesentery vessel nor cellular substance; consequently when an insect is opened and placed in water, all the folds of its canal rise, and are developed from the specific tightness derived from the air in the tracheæ.

The fine membrane lining the abdomen, and enveloped by the rings of the skin and their muscles, may be called peritonæum.

But the most remarkable circumstance belonging to insects in their larva state, and existing in them exclusively, among all invertebral animals, is the portions of cellular texture filled with fat, which may be compared to omenta, and may have the same functions. They seem particularly designed to supply the materials of nutrition to the animal, during all that time, in which, as a chrysalis, it eats nothing, as the fat of the omenta supports life in those quadrupeds, which pass the winter in a lethargic sleep. When the animal changes its coverings and its form, and becomes a perfect insect, these fatty organs probably furnish the prodigious quantity of materials, which the sudden development of so many parts must require; consequently they are not found in the latter state.

The forms, colour, and consistence of these masses vary. In the caterpillars they are oblong, swollen, full of a white fat like cream. In the larvæ of the scarabæi they are large semi-transparent membranes, with many opaque and white grains; in those of the flies and stratyomys they have a flashed appearance, like narrow ribbands irregularly joined. They are inconsiderable, or do not exist at all, in the larvæ of insects, which undergo an incomplete metamorphosis, which eat during their whole existence, and never pass into the chrysalis state. In all the orders they receive numerous air-vessels.

Absorption in Insects.—The nutritive fluid prepared in the alimentary canal is taken up by a particular order of vessels,

called absorbents, in the four first classes of the animal kingdom; these convey it into the blood-vessels, in which it passes to all the organs of the body. The application of the new matter furnished by digestion to the parts of the system is performed in some other way in insects, as they seem to have neither absorbing nor blood-vessels (excepting the crustaceous insects).

Cuvier is of opinion that the nutritive process is performed in this class by *imbibition*. We arrive, says he, at this conclusion by proofs of different kinds; some are direct, but negative; others supply only inductions; their union will probably suffice to produce conviction. In the first place, he continues, no vessels are found in dissecting insects; I have sought for them with the greatest attention, and by the assistance of the microscope, in those organs, which in other classes contain them in the greatest abundance, as the choroid coat of the eye, and the membranes of the intestinal canal; I have never found any thing like them, although the tracheæ and the nerves are very easily discovered, and the innumerable ramifications of the former may be traced with the naked eye. Lyonet, who has described and represented in the larva of the coffus parts a thousand times smaller than the principal blood-vessels would be, could never discover any thing of that kind.

There is indeed in insects an organ, to which many anatomists have given the name of heart; it is a membranous tube, continued through the whole length of the back, both in the larva and in the perfect state, exhibiting alternate contractions and dilatations, which seem to pass successively from one extremity to the other; but, notwithstanding this circumstance, which seems to indicate an organ of circulation, this tube produces no branches, and we can neither attribute to it the functions of a heart, nor discover any other purpose to which it is subservient. Lastly, those naturalists who have observed with the microscope the transparent parts of insects, have discerned only a fluid at rest, bathing them on all sides.

Such are the negative arguments on this subject; those drawn from induction refer principally to two points; *viz.* the mode of respiration in insects, and the form of the secretory organs.

In animals which have a circulation, it is continually collected in a central reservoir, whence it is forcibly expelled to all parts; it always arrives at the organs from the heart, and it is always sent to the heart before it comes back again. It may then have been modified from its source by the action of the air; and, in fact, before it is brought by the aorta and its ramifications to the parts which are to be nourished by it, it circulates through the lung or gills. If this arrangement is not found in insects, the reason probably is that their nutritive fluid is not contained in vessels, that it does not come from a common source, and consequently that it could not undergo any modification in a separate organ before arriving at the parts. It continually and quietly bathes all the parts, which are to draw from it substances suited to their wants; the action of the air should therefore reach it every where, and this point is very completely secured by the disposition of the tracheæ, as there is no point of the body to which the fine ramifications of these vessels do not penetrate, and where the air does not immediately exercise its chemical action; in a word, as the blood cannot go in search of the air, the air is every where brought in contact with the blood.

The secretions of insects are never performed by conglomerate glands; their organs consist, in all cases, as we have just seen in the example of the liver, of long and slender tubes, floating in the cavity of the body, without being connected

ned together, or fixed in any way except by the tracheæ. This appears clearly to be a necessary consequence, and therefore a very probable indication of the absence of blood-vessels. When the powerful agents of circulation exist, they convey with facility the nutritive fluid to the most remote points of the glands; the intertexture of the blood-vessels forms a thick and close tissue, in which the peculiar vessels of the gland are placed. When, on the contrary, there is neither heart nor blood-vessels, nor any force to impel the fluid towards the secretory organs, the latter require a more powerful attractive force; and as this can be exerted only by means of the tissue composing their sides, it becomes necessary that they should be unattached, loose, long, and slender, in order to augment their surface.

Organs of Circulation in the Crustacea.—The heart of the crustacea decapoda is very differently formed from that of the branchiopoda. In the former it is oval, circumscribed, and placed nearly in the middle of the thorax; in the others it is elongated, and extends from one end of the body to the other, so as to form apparently a connecting link between the heart of the decapoda and the dorsal vessel of the other insects. In this point of view it has led some naturalists into error: we shall, however, find a structure which is more analogous to it in the red-blooded worms.

The decapoda (the crabs, lobster, cray-fish, hermit crab, &c.) have an aortic heart, like that of the mollusca. It receives the blood from the branchiæ by a large vessel, which lies longitudinally in the chest to receive this blood by lateral vessels. Cuvier states that this is the case in the hermit crab; but he thinks that in the lobster the branchial veins form two trunks, which go directly to the two sides of the heart. When one of the veins of the branchiæ is injected, the fluid arrives at the heart by the route just indicated. From the same posterior part of the heart arises an arterial vessel, which goes directly backwards, and supplies the organs of generation and the muscles of the tail. The anterior portion produces other arteries, varying in number according to the species.

Each pedicle of the branchiæ contains two principal vessels; an artery and a vein. The venous trunks all go to the heart; and, as we have already stated, by a single trunk in the decapoda: but, in the branchiopoda, where the heart is elongated, they all terminate in it directly, so that a pair of veins enters at each ring of the body. The branchial arteries do not come from the heart. When the latter organ is injected, the fluid does not enter the branchiæ, although it will pass easily from the latter to the heart. In the *squilla fasciata*, Fabr., Cuvier observed a large longitudinal vena cava, extending from one end of the body to the other, under the intestine, and consequently on the opposite surface to that occupied by the heart. Its tissue is much thinner than that of the heart, and transparent, and it produces as many pairs of branchial vessels as the heart receives from those organs. This anatomist has very little doubt that the same vessel will be found in the decapoda, but he had not examined them for this purpose since he first saw it in the other division.

The circulation of the crustacea is then the same with that of the gasteropodous mollusca; viz. a double circulation, of which the aortic system only possesses a ventricle: and even this ventricle does not deserve the name in the branchiopoda, it so much resembles in them a vessel by its elongated form. Under this point of view the circulating system of these animals resembles that of red-blooded worms.

The heart of the crustacea, even in the decapoda, has no auricle; and valves have not hitherto been observed in it.

It is hardly necessary to state, that the blood thrown by

the heart into the arteries, passes through the veins into the vena cava.

The motions of the heart may be seen in the small monoculi of this country, but their extreme smallness prevents us from following the distribution of the vessels. The anatomy of the molucca crab is not yet known.

Circulation of Insects.—All insects have in their back a longitudinal vessel, filled with a transparent fluid, and for a long time regarded as the heart, after the statement of Malpighi, who described it in the silk-worm, and represents it as a knotted canal, that is divided at intervals by contractions. He conceived that each dilatation was a particular heart, and that these different organs transmitted the blood to each other: but he remarked at the same time that the succession of the pulsations was not regular, and that the fluid sometimes took a retrograde course. Lyonet has given a better account of this dorsal vessel. It is an uniform canal, proceeding from the head to the opposite extremity, and enlarging a little in its course, but closed at the two ends. It possesses on each side a certain number of transverse muscular fasciculi, somewhat in the form of wings, which are fixed by their opposite ends to the general covering. Its dilations and contractions are produced by these, which are exterior muscles, and not by its own tissue.

Lyonet assures us, that he has not been able to discover any vessel produced from this, and proceeding into the body, although he has described tracheæ and nerves a thousand times smaller than these vessels must be if they exist. Cuvier has tried all known methods of injection, without any greater success. Swammerdam indeed mentions that he injected small vessels from it in the grylli; but we cannot help entertaining doubts on this subject, until the experiment shall have been repeated with success.

The dorsal vessel of insects cannot then in any manner perform the functions, nor deserve the name of a heart. Perhaps, like all other parts of this kind in insects, it is a secretory vessel: but we are at present quite unable to determine what liquor it secretes, and for what use. Its contents are transparent, light yellow, viscous, miscible with water, easily dried, and then becoming hard and cracking like gum.

Besides the analogy of its contractions, its situation might favour the idea of its being a heart. The latter organ is placed near the back in almost all the mollusca, and in all the crustacea; and this is the position of an organ, which can hardly be regarded in any other light than as a heart, in the arachnidous insects (araneæ, phalangia, and scorpions). It may be observed very easily in the spiders: and may be seen beating through the integuments of the abdomen in the species which have smooth bodies. On removing the integuments we expose a hollow oblong organ, pointed at its two ends, and advancing as far as the thorax by its front end: two or three pairs of vessels very manifestly pass off from its sides. If we add to this account, the fact, that the spiders have no tracheæ, but that their respiration is circumscribed within a small number of vesicles, and that they appear to have glands, we shall be induced to believe that their circulation is more complete, and more analogous to our's than that of other insects.

Respiratory Organs.—The class of insects exhibits two very different arrangements of the organs belonging to this function: the crustacea have gills, resembling those of fishes and of many mollusca; other insects have air-vessels distributed to all parts of their bodies. The branchiæ of the former extract air from the water in which they live, in the same way as the gills of fishes act. The respiration of insects produces in the air the same effects as that of the warm-blooded animals. Experiments shew us that oxygen is consumed

fumed in this case, and that the residue of the air is rendered impure, by the admixture of carbonic acid gas.

An important result of respiration seems to be the maintaining the irritability of the moving powers: hence the definitive result of this process, with respect to the fibre, is power in executing the motions which it has to perform. Thus the energy of the motive force will be in proportion to the quantity of respiration. The organization of insects corresponds to this theory: they are the only class among the lower ranks of animated existence, which possesses the faculty of flying, and we consequently find the tracheæ carrying air over the whole body, so that respiration is carried on at all points. In those insects which do not fly, the force of the muscles may be estimated by the rapidity of their other motions. The running of the millipede and the jumping of the flea, shew that they belong to a very irritable class of animals; the case is analogous to that of the ostrich and cassowary, which run with great celerity, although they are birds without wings.

Respiration of the Crustacea.—Their branchiæ are larger in proportion than those of most of the mollusca. In the decapoda they are attached to the base of the feet, under the lateral and descending edge of the thorax, which confines them within a narrow space. The branchiopoda have no gills in this situation, but under the tail, between the fins, and floating loosely in the water.

In the crabs the structure is in some respects peculiar. Each gill represents a triangular elongated pyramid, attached by its basis only, and having the point directed upwards. The middle of the pyramid is divided by a plane, proceeding from the apex to the basis, and composed of a double membrane; and the body of the pyramid is formed by a large number of plates placed one over the other, perpendicular to the vertical plane just mentioned, and consisting merely of doublings of the double membrane. A large vessel runs along each of the two longitudinal edges of this plane, and penetrates at its basis into the thorax of the animal; one of these is arterial, and the other venous. If we inflate them, immediately all the small laminae which compose the pyramid are distended with air. In the same way the blood is expanded over all the surfaces, and is thus favourably disposed for the action of the water.

There are seven of these pyramids on each side. As the edge of the thorax, which embraces and confines them, is inflexible, a particular mechanism became necessary for renewing the water which washes the surface of the organs. This effect is secured by two plates of a substance resembling parchment, articulated on the chest near the maxillæ, very elongated, and passing obliquely, the one within, between the branchiæ and the body, the other without, between them and the edge of the chest. By compressing the branchiæ, these plates squeeze the water from the intervals of the laminae, and when the pressure is remitted, they allow the introduction of a new portion of fluid.

The branchial pyramids, although placed in a similar situation, are more numerous and complicated in the decapoda with long tails, as the lobster, cray-fish, and palinurus, Fabr. They have rows of cylindrical filaments, instead of laminae, piled on each other on the two sides of the vertical plane; so that their surfaces resemble the shag of velvet. There are several thousands of these filaments in a pyramid; each of them is formed of an artery and a vein united: each pyramid has two, its large artery and large vein ending in the body.

These villous pyramids of the long-tailed decapoda are arranged in groups, between vertical laminae, of which one ascends behind each group. These laminae are attached to

the first articulations of the feet, which cannot move without moving them, and without either compressing or setting free the branchiæ. The lobster and cray-fish have five groups of four pyramids each, and a solitary one before and behind, of which the anterior is very small. This will make twenty-two gills on each side. The first group is attached to the most exterior pair of maxillæ: and the solitary pyramid in front to the pair concealed by the former. The second group is connected to the claws, and the others to the following feet, except the last, which has only a solitary pyramid. In each group the exterior pyramid is attached to the pedicle of the parchment-like plate, and moves with it: the three others adhere to the body of the animal, and have no separate motion. The first solitary pyramid is also attached to its plate; but the last is fixed to the body, and has only a rudiment of a plate behind it. Moreover, two other plates are attached to two maxillæ, anterior to those of which we have already spoken, and support no gills: yet they are placed obliquely against these organs, and contribute to their compression and relaxation. The action of all these plates occasions the expulsion at the two sides of the mouth of all the water in contact with the branchiæ.

The tail of the branchiopoda, particularly of the squillæ, bears on its under surface five pairs of fins, forming broad membranous and ciliated oars, divided into two large lobes, an exterior, which is rather anterior; and an interior, which is a little posterior. The gill is attached to the root of the fin at its inner edge. It consists at first of a conical pedicle composed of the two large vessels: from this proceeds a row of cylindrical tubes, gradually diminished in size from the basis towards the apex: each of these is curved, and forms a long conical and flexible tail, which also supports a very numerous row of long and loose filaments. Each gill contains a very considerable number of these, and resembles, on the first view, a large brush: it is only by separating the filaments that the regularity of their insertion and succession can be perceived. It is almost unnecessary to add that each filament contains two vessels; and that each tail and each tube has the same vascular arrangement, just as in the general pedicle. The branchiæ float in the water, are moved like the fins, and are even agitated between the two lobes of the latter: consequently no mechanism is required for renewing the water in contact with them.

Tracheæ and Respiration of Insects.—Some remarks on this subject will be found in the article ENTOMOLOGY, under the division *Stigmata*. We shall enter here more minutely into the anatomical details.

We have already stated that the surrounding element, the air, distributed by means of an infinite number of tubes, exerts its action on all points of the interior of the body. These canals have been called tracheæ, on account of their analogy to the trachea or large vessel which conveys air into the lungs of such animals as possess those organs. Their structure is remarkable: they are composed of three membranes, an internal and an external one of the common structure; and a middle one composed of an elastic thread, possessing a fine metallic lustre, rolled spirally, or in a double spiral course round the canal, from one extremity of the tube to the other, and admitting of being unrolled with a little address. By this the sides of the tube are constantly maintained circular, so that the passage of the air is always free. Yet all the tracheæ are not provided with this part in their whole length: some, which Cuvier calls vesicular, are dilated at certain intervals, so as to form merely membranous pouches not provided with this elastic support.

The tracheæ communicate externally by small lateral holes pierced on each side of the body, and called stigmata; or some-

sometimes by one or two tubes opening into the anus. The latter structure belongs to the true aquatic insects; some of which, as the larvæ and chrysalides of the libellulæ, have in the rectum a particular apparatus for this purpose, which we shall describe.

The tracheæ of the larvæ do not resemble those of the perfect insects any more than the other organs: indeed the differences in this respect are often still more surprising.

We shall describe the organs successively in the most remarkable families.

Those of the caterpillars are the best known, through the admirable description given by Lyonet of that insect. A nearly cylindrical tube, receiving air by ten stigmata, extends on each side of the body. Its branches go off in a radiating manner, from points exactly corresponding to the stigmata; those at the beginning, which go to the head, are larger than the succeeding ones. We observe here, once for all, that no part is unprovided with these air-vessels, and that the very membranes of their trunks even receive small branches. In the caterpillar they are strong, opaque, and of a fine silvery colour, which, however, depends in part on the contained air; for the brilliancy is lost, both here and in other families, when they are macerated and filled with water or spirits of wine. The air-vessels of the butterflies, produced from these caterpillars, have a very different appearance; they are thinner, less numerous, and possess almost throughout small yellow or white elliptical bodies of a fatty nature: such at least is their appearance in the *atalanta* and the *phalæna pavonia*.

A much more considerable change is observed in the coleoptera lamellicornia: the larva has fasciculi of cylindrical, silvery, and very fine tracheæ, distributed from each stigma over the surrounding parts. In the perfect insect they are of a dead white, swelled every where into small oval or irregularly-figured vesicles, with very thin sides: they resemble trees much loaded with leaves. Examples of this arrangement may be seen in the *melolonthæ*, the *scarabæi*, the *coprides*, the *lucani*, &c.: and it occurs in no other families.

The hymenoptera and the diptera have two large vesicles at the basis of the abdomen, and some small ones: but the number is always inconsiderable.

The *hydrophilus piceus* has four large ones at the basis of the abdomen; and, as this is a strictly aquatic insect, they may assist the animal, as the swimming-bladder of fishes does, in raising or depressing itself in the water.

The principal air opening in the aquatic larvæ is generally near the anus, that they may the more readily reach the air: in this case the two lateral trunks of the tracheæ are of great size, apparently for the purpose of holding a larger supply of the fluid; and the branches go off in the form of slender cylindrical threads. This arrangement is found in the larvæ of two very different families, the *hydrophilus* and *stratyomys*. The latter, as all the aquatic larvæ of the diptera, can elongate its tail considerably in search of air without elevating the body; the anus is surrounded by small tracheæ in the form of radii. These insects suspend themselves at the surface of the water by means of their tails.

The larvæ of the libellulæ exhibit the most singular disposition of the respiratory apparatus. The orifices, which absorb the air, are found in the rectum, under the form of very small tubes, ranged in little groups in ten rows, which represent so many long pinnated leaves. A number of small tracheæ, equal to that of the tubes within, passes from the rectum into the body; and these terminate in four trunks extended through the whole length of the body. Two of these are of vast size, and appear to serve as reservoirs; for they send the air which they contain by transverse

branches into the other two smaller trunks, which proceed as usual along the sides of the body, and supply all parts with air-vessels. Each of them produces a recurrent branch, which, after having crossed the corresponding one, proceeds along the intestinal canal, and gives it an infinite number of small ramifications. Cuvier thinks that the air contained in these different trunks follows a determinate course, relative to the occasions of the parts to which it is distributed. The four trunks and the two recurrent branches are found in the perfect libellula; but they no longer derive their air from the anus. As the animal lives in the atmosphere, its tracheæ are supplied from stigmata, near each of which is a vesicle, serving probably as a reservoir. There is also a single row of larger vesicles along the back.

The tracheæ appear to be deficient in some insects, that is, in the arachnida, where we have stated that something like a heart is perceptible. There is however a single stigma at the basis of the abdomen in the spider: but it leads only into a vesicle, from which no air-vessels have been traced. Can this be the lung? and are there blood-vessels distributed on its sides?

Organs of the Voice.—By the voice we understand the sound produced by animals in expelling air from their lungs, through the glottis: in this sense it can be possessed by those animals only which have lungs, as the mammalia, birds, and reptiles. Several insects produce sounds, and often very considerable ones, by the motions of various parts of their body: but there are no express organs for this purpose. By these sounds they invite each other, and express their wants or their passions.

Organs of Generation.—Many very striking peculiarities are observed in the propagation of insects. The two sexes of one and the same species are often so extremely unlike each other, that they would rather be taken for completely different species, than for animals that could pair together. Among the bees and other neighbouring species, the greatest number of individuals have no sex; they are conceived and born without being destined, as in the ordinary course, to conceive or produce impregnation. Their copulation is performed in a very extraordinary manner in many instances. The act is performed on the wing, and some are winged only during the short season of copulation. Several copulate only once, and the act is very soon followed by death: the life of the animal may be prolonged by deferring the copulation.

In several, as the cochineal insect (*coccus cacti*), and the chigger (*pulex penetrans*), the pregnant female increases to an enormous size. The abdomen of the white ant (*termes fatalis*), when ready for laying, is calculated to be two thousand times larger than it was before impregnation.

Organs of Generation in the Crustacea.—These among the invertebral are what serpents and lizards are among the vertebral animals; their exterior organs are double; but, which is peculiar to themselves, their internal organs, both testicles and ovaries, are sometimes united into one.

The decapoda in general have two penises and two vulvæ: the openings of the latter are found at the basis of the third pair of feet. The two penises are quite at the back of the thorax, behind the fifth pair of feet: in this situation there is, on each side, a horny, pointed, tubular piece, opened longitudinally, which may be introduced into the vulva, and conducts the penis which passes through this tube. We see in the male, on the inside, two very tortuous vasa deferentia, each of which is continued to the root of the penis of its own side. In the lobster and cray-fish the two canals proceed from a testicle divided into six lobes, situated under the heart, behind the stomach, and between the two masses of hepatic vessels.

vessels. The testis is whitish, and has a glandular appearance. In the crabs the two canals are very large near the penises, become afterwards slender, and are so convoluted as to form the appearance of a gland on each side. These glands are not united.

In the common lobster the two ovaria are joined, so as to form a single one to all appearance. The two oviducts are short, straight, and go directly to the vulva: the latter are simple holes pierced in the substance of the corselet, near the third pair of feet in the crab, and in the very basis of this third pair in the lobster and hermit crab.

The female crustacea attach their eggs, after laying them, to the filaments of the hair under the tail, and carry them in that situation until they are hatched.

Organs of Generation in the proper Insects.—The external parts are simple, and placed at the posterior extremity of the body in most insects. To this rule there are some exceptions, both in number and position. In the spiders they are double; and the male organs are placed on the maxillary palpi; the phalanges have a simple male organ, coming out from the root of the abdomen.

The libellulæ have the male organ at the basis, and not at the point of the abdomen; and hence arises their very singular attitude in copulation. The male seizes the neck of the female with the hooks at the extremity of his abdomen, until the female bends herself back, and brings the extremity of her own abdomen to the basis of that of the male.

The generative organs of the iuli are about the middle of the body.

I. Male Organs.—These consist in general of a penis with its coverings, of a common spermatic canal, and of two pairs of organs, which may be regarded as testicles and vesiculæ feminales. Each of these pairs may be more or less subdivided; they vary in figure and in size.

1. In the Coleoptera.

a. In the Lamellicornia.—The genera separated from the scarabæi of Linnæus, as the melolonthæ, cetoniz, trichiz, scarabæi, &c. have numerous globular testicles and vesiculæ in the form of tubes, as slender as threads, and excessively long. In the scarabæus nasicornis, for example, the two vesiculæ feminales are more than twenty times the length of the body, and are convoluted into a packet or mass, which it is not very difficult to unravel. Their tube is a little enlarged before it joins the common canal. On each side there are six testicles of a small size, and producing each an excretory tube more slender than a hair: these six small tubes are united into one canal, which is joined to that of the opposite side precisely at the point where the vesiculæ feminales are united. The common canal, resulting from these four tubes, becomes large and muscular, and then goes into a horny sheath, terminated by a kind of pincers, between the laminae of which the penis is placed. The latter is merely a small cylindrical tube. It appears that the two branches of the pincer are introduced into the vulva, and then separated so as to facilitate the entrance of the penis. Swammerdam has given a very accurate figure of these parts.

The melolontha resembles the *S. nasicornis*.

The organs are more complicated in the cetoniz: there are twelve testicles on each side, and, besides the filiform vesiculæ, which are probably thirty times as long as the body, there are two other short and thick pairs; the shortest of the latter has its extremity forked. The canals of the three pairs of vesiculæ, as well as the canals of the two groups of testicles, join together at the same point to constitute the common spermatic tube, which goes to the penis.

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The trichiz resemble the cetoniz.

The coprides, or dung beetles, and the lucani, or flag beetles, do not follow the same type: they have only one testicle on each side, and this is a globular and compact mass made up of the convolutions of a single tube. Their vesiculæ feminales are also filiform, but not so long in proportion as those of the scarabæi.

b. In the Carnivora.—The organs are very simple in the dytiscus; there are two large vesiculæ of moderate length, very little convoluted; two globular testicles covered by a yellowish matter, which may be removed; they are then easily unravelled into a single, filiform, slender and long vessel. The vas deferens is merely the continuation of this: it enters the vesicula a little before that joins the opposite tube to form the common spermatic canal.

c. In the Clavicornia.—The structure of the hydrophilus is more complicated than that of the dytiscus: it has two oval testicles, each of which is formed by the convolutions of a single vessel. The vas deferens, which is as fine as a hair, swells into a small oval vesicle where it ends in the common canal. The principal vesiculæ feminales are large, with strong sides, spirally convoluted, and terminating suddenly in a small vessel folded in zig-zag, and forming the appearance of another smaller testicle. There are, moreover, two accessory vesiculæ, with thin sides, each divided into three branches, and into some small blind appendices. The common spermatic canal has a muscular enlargement towards its middle, and becomes again suddenly small to enter the penis. These parts are figured by Swammerdam, but rather rudely.

The staphylini have two large oval testicles, formed of an infinite number of small short vessels, resembling those brushes of which the hairs project in every direction. The vas deferens is small and short. There are two pairs of vesiculæ, both cylindrical and tolerably large; one of them is folded in a serpentine manner round the intestine, and may be four or five times the length of the body; the other is much shorter. The common spermatic canal is cylindrical and short. The penis is also cylindrical, covered with horny pieces, but has no pincer. An oval bladder, of which the use is unknown, but which resembles in its position and figure the urinary bladder of the mammalia, is found at its internal basis.

d. In the Filicornia.—The common spermatic canal is eight or ten times the length of the body in the blaps mortifaga; four organs resembling vesiculæ are connected to it at its origin. Two of these first make some very regular spiral turns, growing at the same time smaller; and then enlarge again and are irregularly folded. The two others have a zig-zag course, and are much shorter.

2. In the Orthoptera.—The grylli have two considerable oval testicles attached to the back: they are covered by a yellow mucosity, in which the tracheæ may be seen beautifully distributed. They are composed of small short vessels, which make up a kind of brush. The vas deferens is folded in the form of an epididymis: a little before joining the opposite one, to form the common canal, it is enlarged, because it receives two groups of vesiculæ. One of these contains more than sixty, and the other above two hundred much smaller than the former. The four bundles fill nearly half the abdomen. Two small oval vesicles are found at the very point of union of the two vasa deferentia.

3. In the Hemiptera.—The water scorpion (nepa scorpioides) has two small, short, and cylindrical vesiculæ, two large vasa deferentia convoluted like the epididymis, and divided at their origin, each into four small testicles, each of which is again prolonged into a very long filiform vessel. These eight vessels are convoluted into a mass.

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4. *In the Lepidoptera*.—There are two different forms in this order: the bombyx pavonia will serve as an example of one, and the same has been imperfectly exhibited by Swammerdam and Malpighi in the silkworm moth (bombyx mori). The common spermatic canal is divided into two vesiculæ feminales, at first a little enlarged, and then prolonged in the form of tubes. They continue united to each other in half their length. The vasa deferentia enter in a very slender form into the swellings of the vesiculæ. They gradually enlarge, and terminate on each side in a mass, which may be regarded as a testicle. Malpighi has represented the vesicles broken a little above the insertion of the vasa deferentia; and Swammerdam a little beyond this point. The testicles are smaller in the pavonia than in the bombyx mori.

The second form may be exemplified in the sphinx euphorbiæ, and it is just the same as Swammerdam represents in the papilio urticæ. The common canal, much longer, is divided into two long and slender vesiculæ, each of which is joined by a vas deferens: but the two last, instead of having separate testicles, are united into a single rounded mass.

The preceding are the species of insects, in which Cuvier has hitherto observed the male organs: there are three others in Swammerdam, which agree with these in the principal points.

The bee, among the hymenoptera, has two large oval vesiculæ, two rounded testicles, with long filiform vasa deferentia. There are two short and small accessory vesiculæ: the common canal is enlarged before it enters the penis.

In the order diptera the stratiomys has two oval testicles, formed, like those of the silpha and gryllus, of small vessels; two vasa deferentia, and two simple filiform vesiculæ. The common canal is of a middling size. In the fly, which lays in cheese, on the contrary, there is a very long common canal, very short vasa deferentia, and large oval vesiculæ divided into two lobes.

II. *Female Organs*.—These are much more uniform than the male in the whole class. They consist, in general, of a common oviduct, opening at the vulva, and divided at its origin into two branches, each of which is again divided into a certain number of conical tubes of various length. The ova are so arranged in the interior of these tubes, that the largest are the nearest to the oviduct, and that the others gradually decrease in size to the point of the tube, where they are imperceptible. When the ova have been discharged, the tubes remain empty. They may be already discerned in the chrysalis, a little before the metamorphosis. Secretory vessels of various forms end in the oviduct, and deposit in it fluids for covering the eggs or for forming a shell.

The scarabæus nasicornis has six oviferous tubes on each side, each containing five or six eggs: an oval vesicle and a small but rather long vessel end in the oviduct.

The carabi have ten or twelve tubes, and the dytiscæ twelve or fifteen; the oviduct has a simple and small bladder, which is prolonged further in the carabus.

In the silpha atrata there are seven or eight tubes, and each contains four eggs. The latter do not become large until they arrive in the branches of the oviduct, which are of considerable size.

The tubes are very numerous in the hydrophilus, and form two large branches; round the basis of each of these are five long and large secretory vessels containing a green liquor.

The butterflies have on each side four very long tubes, filled with a large number of eggs, and forming, particularly in the fruitful species, rows like strings of beads, four or

five times longer than the body. The common oviduct is so short as to be scarcely perceptible; it receives one or two vesicles, and two long vessels.

The grylli have on each side about thirty tubes, each of which does not contain more than three or four visible eggs: they are united by the tracheæ, and by a mucous substance, into two oval masses. The common oviduct receives a vesicle and a long vessel.

The bees have the two last mentioned parts: their rows of eggs are numerous on each side. Cuvier thinks that he can perceive very small ones in the neuter bees, which would confirm the notion of their being imperfectly developed females.

In the silpha there are five, and in the notonecta six rows on each side.

The libellulæ have two very long branches; their tubes are short, small, and almost innumerable.

The various boring instruments which certain genera, as the gryllus, ichneumon, tentredo, and cynips, employ for depositing their ova in suitable situations, may be arranged with the organs of the female sex. But, as these parts are completely external, and have been well described by naturalists, we shall not say any thing more on the subject.

Spinning Instrument of the Caterpillars.—Almost all the caterpillars spin themselves a covering, or at least an attachment of some kind, before their metamorphosis. The caterpillar of the bombyx mori is the most celebrated in this respect, since the thread composing its covering being abundant, flexible, brilliant, and easily wound off, forms the material from which our most splendid silks are formed. Other caterpillars, as that of the bombyx pavonia, form as large a quantity of silk, but it is hard, liable to break, and cannot be wound off.

The secretory organs producing the silk are the same in all caterpillars, excepting varieties in size, which is proportionate to the quantity of silk produced. These, like all the other secreting organs of insects, are two long tubes, commencing in a very slender and convoluted form; then growing larger to form a kind of reservoir, and terminating in an excretory canal so small that it can hardly be seen. The two canals terminate under the lower lip; and the animal draws out and elongates the ductile matter by moving its head from side to side.

Organs for producing Light.—Several animals of this class have the power of producing light; and the substance in which this property resides is sometimes diffused through the animal's body, sometimes collected into a particular organ. The luminous matter must be regarded as an animal secretion produced like any other animal substance. A very full and interesting account of this subject is contained in a paper by Mr. Macartney, in the Philosophical Transactions for 1810, from which the following passages are extracted.

“The power of emitting light has been observed in two animals of the crustaceous order, and seemed to reside in the whole body. One of these, observed by sir Joseph Banks, in the passage from Madeira to Rio Janeiro, resembled the common shrimp, but was less: it is named by Mr. Macartney cancer fulgens. The other was found in the Red sea by captain Horsburg, appeared to be a monocus, and to belong to the genus limulus of Müller. Mr. Macartney calls it limulus noctilucus. A third crustaceous animal of the genus lynceus of Müller, possessing luminous properties, has been seen off the coast of Malabar. Of other insects some species yield light in the five following genera; viz. clater, lampyrus, fulgora, paufus, scolopendra.

dra. The only animals which appear to possess a distinct organization for the production of light are the four first of the last mentioned genera.

"The light of the lampyridæ (glow-worm) is known to proceed from some of the last rings of the abdomen, which, when not illuminated, are of a pale yellow colour. Upon the internal surface of these rings there is spread a layer of a peculiar soft yellow substance, which has been compared to paste, but by examination with a lens I found it organized like the common interstitial substance of the insect's body, except that it is of a closer texture, and a paler yellow colour. This substance does not entirely cover the inner surface of the rings, being more or less deficient along their edges, where it presents an irregular waving outline. I have observed in the glow-worm, that it is absorbed, and its place supplied by common interstitial substance, after the season for giving light is passed. The segments of the abdomen, behind which this substance is situated, are thin and transparent, in order to expose the internal illumination. The number of luminous rings varies in different species of lampyris, and as it would seem at different periods in the same individual. Besides the luminous substance above described, I have discovered in the common glow-worm, on the inner side of the last abdominal ring, two bodies, which to the naked eye appear more minute than the head of the smallest pin. They are lodged in two slight depressions, formed in the shell of the ring, which is at these points particularly transparent. On examining these bodies under the microscope, I found that they were sacs containing a soft yellow substance, of a more close and homogeneous texture than that which lines the inner surface of the rings. The membrane forming the sacs appeared to be of two layers, each of which is composed of a transparent silvery fibre, in the same manner as the internal membrane of the respiratory tubes of insects, except that in this case the fibre passes in a spiral instead of a circular direction. This membrane, although so delicately constructed, is so elastic as to preserve its form, after the sac is ruptured, and the contents discharged.

The light that proceeds from these sacs is less under the controul of the insect, than that of the luminous substance spread upon the rings: it is rarely ever extinguished in the season that the glow-worm gives light, even during the day; and when all the other rings are dark, these sacs often shine brightly.

The organs for the production of light in the genus elater are situated in the corselet; these likewise consist of a peculiar yellow substance, placed behind transparent parts of the shell, which suffer the natural colour of this substance to be seen through them in the day, and when illuminated give passage to the light. On dissecting the organs of light in the elater noctilucus, I found that there is a soft yellow substance of an oval figure lodged in the concavity of the yellow spots of the corselet, which parts are particularly thin and transparent in this species. This substance is so remarkably close in its texture, that, at first view, it appears like an inorganic mass, but with a lens it is readily perceived to be composed of a great number of very minute parts or lobules closely pressed together. Around these oval masses the interstitial substance of the corselet is arranged in a radiated manner, and the portion of the shell, that immediately covers the irradiated substance, is, in a certain degree, transparent, but less so than that which lies over the oval masses: it is therefore probable that the interstitial substance in this situation may be endowed with the property of shining. In the elater ignitus the masses of luminous substance are extremely irregular in their figure;

they are situated nearly at the posterior angles of the corselet, and are more loose in their texture than the oval masses of the noctilucus, resembling rather in composition the interstitial substance which surrounds these masses in that species. The shell of the corselet is somewhat thinner, and more transparent along both sides of the margin, than at other places, but it is not, as in the noctilucus, elevated, and peculiarly clear and thin immediately over the seat of the luminous organ; consequently the light emitted by the elater ignitus cannot be very brilliant."

In the fulgora candelaria and lanternaria, Mr. Macartney has found the hollow organ, from which the light proceeds, to communicate freely with the external air, by means of a chink or narrow aperture, placed on each side of the root of the proboscis. This organ is lined by a membrane, between which and the horny part or shell there appears to be interposed a pale reddish soft substance, arranged in lines or stripes in the candelaria. It could not be determined, whether this furnishes the light, or is the pigment, upon which the colour of the proboscis depends.

The globes of the antennæ constitute the organs of light in the pausis spherocerus.

"It is worthy of remark," says Mr. Macartney, "that in all the dissections I have made of luminous insects, I did not find that the organs of light were better or differently supplied with either nerves or air-tubes, than the other parts of the body. The power of emitting light likewise exists in many creatures, which want nerves, a circumstance strongly marking the difference between animal light and animal electricity." Swammerdam's Book of Nature, or History of Insects: Lyonet Traité Anatomique de la Chenille, qui rouge le bois de saule: Cuvier Leçons d'Anatomie comparée.

INSECTS infesting the human body. The parasitic animals, which are most commonly found inhabiting, and deriving their nutriment from, the internal cavities of the human body, are the three species of worms, which are denominated, by naturalists, *ascaris*, *lumbricus*, and *tania*; that is, the maw-worm, or thread-worm, round-worm, and tape-worm; to which may be added the *trichuris*, which is occasionally seen. (See these words.) The external parts of the body, again, afford a nidus and sustenance to one or two of the insect tribes, especially the *pediculi* of the head and of the *pubes*; the former of which are sometimes bred in great numbers, and infest other parts of the surface, producing a loathsome and very obstinate disease, the *morbus pedicularis*, or lousy disease. (See PHTHIRIASIS and PRURIGO.) It is not our object, however, to treat of these under the present article; but merely to notice briefly the occasional existence of various species of the winged insects, in the different cavities of the human body, especially in their first state, that of *larva*, caterpillar, or grub; and to point out the manner in which they are probably introduced.

The medical writers of the sixteenth and early part of the seventeenth century have recorded instances of various reptiles and other animals, which were dislodged from their abode in different parts of the body, such as frogs, lizards, serpents, &c.; which may be found on consulting the collections of Borelli, Marcellus Donatus, Schenck, and others. But their credulity was at least equal to their learning and industry, and subsequent observation has not confirmed their statements, which probably originated from gross ignorance of the economy of these creatures, or from wilful deception on the part of those from whom they were said to have been discharged. On the other hand, the microscopic philosophers not only peopled every organ of the body with worms and animalcules; but believed that all contagion

consisted of the same beings, which, according to their nature, communicated scabies, and syphilis, small-pox, dysentery, the plague, and every other infectious disorder. (See the learned dissertation of Dan. Le Clerc, entitled "Historia Lator. Lumbricorum," p. 274, *et seq.*) But more accurate investigation has likewise caused these notions to be exploded; and the catalogue of parasitic creatures, which infest the human frame, in addition to the worms, &c. above-mentioned, is reduced to a few varieties of the insect tribes.

It is well known, that the internal cavities and passages of some animals, especially the nostrils and adjoining sinuses, the stomach, and *rectum* or straight gut, in horses, sheep, and cows, are the situations in which alone certain insects are apparently intended by nature to breed, and to be nurtured in their first stage of existence. This is the case especially with the several species of *asrus*, the grub or larva of which is called a *bott*. (See an ample history of this insect, under the article *BOTTS*.) The *ova*, or eggs of these insects are introduced into those passages by the parent insect, or are conveyed thither by licking with the tongue, inhaling odorous matters, &c. Now, although there does not appear to be any species of insect destined particularly to be nurtured in the human body; yet it appears beyond all question, that the larvæ of some of the winged insects are occasionally hatched and nurtured in the nostrils and sinuses, as well as in the stomach and intestines of man.

The want of accurate investigation, since the subject of entomology has been well understood, leaves us in a state of uncertainty as to the number of insects which are thus nurtured within the human body. It seems probable, however, as we might, perhaps, have anticipated, that the most frequent instances which occur, are those of our most common domestic insect, the varieties of *the fly*. The larvæ of several of the species of the fly (*musca*, Linn.) are aquatic, or at least inhabit moist and wet places, and therefore seem to be adapted to exist in the fluids of the human stomach: and the author of this article is in possession of some larvæ of the common *house-fly*, the *musca domestica minor* of Degeer (*Histoire des Insectes*, tom. v. tab. 2. fig. 4.), which were rejected alive from the stomach of a man by vomiting (see *Edin. Med. and Surg. Journal*, for Jan. 1811, p. 41.); and of others of the same fly, which were passed by stool by another person. The larva of another species of fly is also figured in the *Journal*, just referred to, by Dr. Cheyne, now of Dublin: and several examples of the larvæ of *flies*, discharged from the human intestines, are on record. Dr. Wahlbom, of Upsal, has related the case of a girl, who, after suffering considerable pain in the stomach and left side, discharged by stool a number of larvæ on several successive days, after which she was relieved from the complaint. "One of these larvæ, while it was kept in a phial, was converted into a fly, which proved to be the *musca nigra* of Linnaeus. (Faun. Succ. 1105.)" Dr. Wahlbom also states, "that a few years ago there was a girl in Upsal, from whom a large quantity of worms were brought away, and these were *fly-worms*. N. Faun. Succ. 1064;" for an account of which he refers to Dr. Du Bois' *Treatise de Tenia*. (See *Med. Chirurg. and Anatom. Cases and Experiments*, communicated to the Royal Academy of Sciences at Stockholm, translated from the Swedish, 1757, case 24.) Ruysch has described and delineated both the larvæ, and the flies which originated from them, after they were discharged (it is affirmed) by urine, by a nobleman, in considerable quantities; and Tulpins has mentioned a similar case, and has also figured the larvæ, which closely resemble those in the writer's possession.

It must be acknowledged, however, that the bladder is the least probable *nidus* for the larvæ of insects, and we cannot readily conceive how they should find their way into that cavity: while, on the other hand, mistakes may be made upon such a subject with the greatest facility, as Vallisneri long ago remarked. These larvæ might have crept or fallen into the utensils, or the *ova* might have been deposited there, and the larvæ afterwards observed in the urine. An instance of this kind of mistake was related to the writer by an eminent surgeon. A lady was in great alarm, from the belief that she frequently passed from the bowels several little red worms, extremely lively in their motions, which were found in the excretions. But it was strongly suggested, that these worms must be inhabitants of the water-closet; and upon accurate examination, the suggestion was confirmed; they proved to be the larvæ of the common *gnat*, which are well known to be aquatic in their mode of life. In all cases, therefore, it is necessary to be cautious in examining all the circumstances, before it be concluded, that insects, found in the excrementitious discharges, actually passed from the human body.

There is another species of insect, which, in its state of larva, or caterpillar, appears to be not unfrequently an inhabitant of the cavities of the human body, though not so commonly as the different species of fly; we mean the common *black beetle*, the *tenebrio molitor* of Linnaeus. The grub of this insect is a sort of caterpillar, about an inch and a quarter in length, and equal to a large crow-quill in circumference, with six feet near the head, but destitute of feet at the other extremity: its body is divided into thirteen sections. The introduction of this larva into the human body, or of the *ova* from which it is hatched, will be readily understood, when we mention that it lives principally in flour or meal; whence from the time of our oldest writer on insects, Mousset, it has been known by the appellation of the *meal-worm*. This writer has given a rude figure of the grub. (See his *Insectorum Theatrum*, Lond. 1634. lib. ii. cap. 20. p. 254.) Two cases, in which this meal-worm was discharged from the human body, have come to the knowledge of the writer of this article. (See *Edin. Med. and Surg. Journal*, above quoted.) Another is mentioned and figured by Dr. Kellie, of Leith, in the same *Journal*. And Tulpins has given a figure of the same larva, two of which, he says, were passed from the bladder of a woman of fifty years of age, and a similar one from the nose of another woman, who had previously suffered severe headache. (See his *Observ. Med.* lib. ii. cap. 51. tab. 7. fig. 3; and lib. iv. cap. 22.) The discharge of two from the bladder was probably inferred, by mistake, from the grubs being found in the utensil which received the urine: but the escape of the one from the nose is probably correctly stated; for in this way the larvæ passed in one of the cases, to which we have just alluded, and the nose, or the adjoining cavities, are common receptacles for the *ova* or larvæ of other species of insects, as we shall presently shew. Forestus has recorded some cases, in which the grubs were most probably of the same nature. He mentions the circumstance, which he witnessed, of a girl who rejected from the stomach two beetles, one at the interval of two days after the other, and likewise a living worm or grub, which was, in all probability, the grub of the beetle. He also mentions the ejection of a species of caterpillar, "*vermem erucæ similem*," by vomiting, after which a severe pain of the stomach of considerable duration was removed. *Foresti Opera*, lib. xxi. obs. 25.

Several of the insects above-mentioned were discharged from the nose, in which cavity, in brute animals, the ex-

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istence of larvæ is very common, and the *ova* appear to be actually deposited there by the parent insect. Mr. Bracy Clark questions the existence of human *botts* (*æstrus hominis*); but that insects of this species sometimes find a *nidus* in the nasal passages of the human subject, is proved by a case, related by Dr. Heysham, of Carlisle, in which three botts were discharged from the *antrum* of Highmore, or *sinus* of the cheek of a woman, after that cavity had been perforated by a trocar. An intolerable hemicrania was occasioned by their presence, and ultimately proved fatal. (See Medical Communications, vol. i. art. xxx. and plate 1. figs. 2 and 3.) An example of a *centiped* lodging in the frontal *sinus* is recorded in the Edin. Medical Essays, vol. v. p. 991. In tropical climates, as we learn from Dr. Lempriere, the maggots or larvæ of the large blue fly, which are constantly buzzing about the sick, are generated in the nose, mouth, and gums, in the last stages of fever, when the patients sleep or doze with their mouths open, the nurses finding great difficulty in preventing the deposition of the *ova* in those parts. This author mentions one instance, in the lady of an officer, who had escaped from the attack of fever, but in whom "these maggots were produced, which burrowed and found their way by the nose through the *os cribriforme*, into the cavity of the cranium, and afterwards into the brain itself, to which she owed her death." Lempriere, Obs. on the Dis. of the Army in Jamaica, vol. ii. p. 182.

It is probable that those cases on record, in which worms were said to be coughed up from the lungs, were in reality instances of the larvæ of insects, bred in the posterior cavities of the nose, and removed by the agitation of coughing into the throat, and thence expelled. See a case of this sort, related by the late Dr. Percival, in his Med. Essays, vol. iii. p. 272, in which two masses of grumous blood were brought up by coughing, as large as a nutmeg, one of which, when opened, "was found to contain a considerable number of worms, like maggots, in a very lively state."

Besides the larvæ of *flies*, of the *black beetle*, and of the *æstrus*, above-mentioned, scarcely any other insects are described upon good authority, as being nurtured in the human body, if we except the *millepedes*, which are mentioned by some authors. It is impossible to say much on the subject of destroying these larvæ by medicine; since their existence cannot be ascertained before they are actually discharged and seen. The symptoms produced by the irritation which they excite, consist only of severe pains in the parts where they happen to be, which of course cannot be distinguished from pain occasioned by other causes. If the existence of the worms was known, or could be surmised, perhaps the internal exhibition of the oil of turpentine might be resorted to with success; for it appears that this liquor is poisonous to all the insect tribe, as well as to worms. Experience has now decidedly proved its efficacy in the destruction of the tape-worm. (See Edin. Med. and Surg. Journal, for April and July, 1810.) It has been used with success in the way of glyster in the case of ascarides; and Dr. Lempriere found it serviceable when injected into the passages infested by maggots.

INSECTS, Anatomical Use of. The insect-world affords us numerous uses, and those many of them such as no one would at first thought imagine, and which no other operations or operators could so well effect. In the minutiae of anatomy, where knives cannot be introduced, the maggot or the ant may be employed with great success. Skeletons of fetuses have been prepared by burying them in an ant-hill, and that in so accurate and perfect a manner, that all who have seen them, have admired by what means they could be so nicely finished; and the secret of the great

Ruysch, by which he cleared away the parenchymatous substance from his vascular preparations, was of this kind. After injecting the vessels of any part with wax, all that remained to the completing of these preparations, was the taking off the parenchymatous or fleshy matter from between and among them. Other anatomists of his time did this by the knife, or by maceration in water and other liquors; but it appeared a sort of magic to them, that his were always not only much sooner executed, but to a greater nicety and perfection than their's ever possibly could be. His method was only to put a number of the common flesh-eating maggots to the substance; and these regularly eat away all the flesh, their heads getting into crevices which no instrument could reach, and the whole substance of the injection remained unhurt, as their soft bodies could glide between its nicest parts without injuring them; and the wax being no food for them, was in no danger of being eroded, even in its smallest pieces. The several sizes of the worms or maggots bred from the eggs of different flies were of great use in the perfecting of the preparations; for while the larger sort eat the more fleshy parts, where the vessels are large and but few in number, the middle-sized maggots got into the interstices of the more vascular parts, and the most minute of all, which are usually also the most numerous, kept about the surface, and eat away between and among the capillary vessels.

The maggots produced from flies are not the only animals fit for this kind of business. There are several species of beetles of the smaller kinds, whose eggs hatch into a six-legged worm, which eats as much and as nicely as the fly-maggots. All these may be employed very successfully in the preparations of the parts of animals.

These nice anatomists are not confined to animal substances; they often exert their power also on vegetables. Many of them feed on the leaves and fruits of plants; and some species of these work so nicely, that they eat away all the outer membrane and internal parenchymatous substance of the leaves, so as only to leave the net-like plexus of vessels standing. Yet these being unhurt shew the true figure of the leaf, and are a sort of vegetable skeletons, but very poorly imitated by art in the common way, by long macerations in water; this method usually destroying and washing away many of the smaller vessels, which the tender mouths of these creatures spare. If they exert their skill often upon leaves in this manner, they do it also sometimes with equal, if not greater, success upon fruits. As in the leaves, those which have the tenderest parenchyma and the firmest ribs succeed best; so also it is in fruits. The leaves of the rufous or butcher's broom are often found thus beautifully anatomised; and of all fruits, none succeeds so well as that of the stramonium, or thorn-apple. Wherever this plant grows in any plenty, the fruit towards autumn, while it is yet full of juice, is attacked by a small worm, which eats away all the parenchyma, and leaves every vessel standing in its place; and this not only in the outer coat of the fruit, but in the very inner cells of the seeds. These vessels remain exactly in the shape of the fruit, and, growing white with the air, exhibit the most elegant and beautiful skeletons imaginable, while yet standing on the plant. The animal which effects this, is a hexapode worm produced from the egg of a small beetle: and differs very little from some of those which so elegantly eat away the fleshy parts from the injected anatomical preparations. These are gregarious animals like some species of the smaller caterpillars, and numbers of them are always at work together on the same leaf or fruit, so that the skeleton is soon made. They begin by piercing a number of little holes

into

INSECTS.

into the substance of the leaf, and thence burrow under the integument till they meet one another; and this being done all over the leaf, they leave it, and go to work upon another.

INSECTS. Vegetable Diseases of. All such vegetable affections or diseases as are produced by different sorts of animals of the insect kind, are very numerous according to their nature and those of the plants: but the chief insects that affect plants of the fruit-tree kinds, are those of the aphid. acarus, ant, chermes, cicada, coccus, earwig, papilio, phalæna, and thrips tribes.

And of the first sort there are a vast number of species, each tree being said to be infested by a different distinct species. Hence the author of the "*Système Vegetabilium*" has denominated them from the trees on which they are found; as the cherry aphid, the currant aphid, the plum aphid, &c. The males are few in comparison with the females, and have wings, while the latter are numerous and without them. See PUCERON, and VINE-FRETTER.

The second is a highly destructive insect in houses where forcing is practised. It is not furnished with wings, but the female is oviparous. The species, as in the former case, are very numerous. It often commits great mischief on vines, peaches, nectarines, cherries, forced kidney-beans, melons, &c. See *Red Spider*.

And the third, or ant, is highly injurious to fruits, especially those of the peach kind, as they become in a state of maturity. They run all over the trees, and the best fruit is occasionally filled with them. It has been supposed by some that they are of use by devouring the alaphides on the trees; but Mr. Forsyth is of a different opinion, and we have seen fruit much spoiled by them in various instances.

The best method of destroying them, according to the above author, is, by making holes in the ground along the side of the wall where the fruit-trees are, by an iron crow, so that the inside surface may be quite smooth. These insects, from being disturbed, soon come to the holes, and fall into them; when, being prevented from getting up by the smoothness of the sides, they may be readily destroyed by pouring water upon them. But more effectual methods are, either by mixing quick-lime with foot, and placing it on their tracks, or putting it in their nests, and then pouring water, or urine and soap-suds, upon it, so as to slack it, confining the heat by a turf or some earth. The heat thus produced soon destroys them. The powder of stavesacre, laid round the stems of the trees, is said to prevent their running upon them and thereby becoming injurious.

The fourth, or chermes, belongs to the order hemiptera; and there are several species. Their specific names are taken from the different plants on which they are generally met with: as the chermes graminis, or grass bug; chermes ficus, or fig-tree bug, &c. The last is one of the largest of the genus, being brown above and greenish beneath, and has four long wings, placed in the form of an acute roof. The larva is of an oblong form, and has six feet, but its motion is slow. When attempted to be caught, the chermes makes its escape rather by leaping than flying, by means of its hinder legs, which play like springs. Several of the species are provided at the extremity of their bodies with small sharp-pointed implements, but which lie concealed; and these they draw out in order to deposit their eggs, by making punctures in the plants that suit them. It is in this way that the fir tree chermes produces that enormous scaly protuberance which is sometimes found at the summit of the branches, and which is formed by the extravasation of the juices occasioned by the punctures. The young larvæ shelter themselves in cells contained in the

tumour. These insects are capable of being destroyed in the same manner as the cocci tribe.

The fifth, or cicada, belongs to the same order as above, and the larvæ of many of this tribe void large quantities of frothy matter upon the leaves and branches of the plants and trees, in the midst of which they are always concealed, probably for protection, and to be shaded from the same influence. These insects should be destroyed, as the froth is unpleasant, and the leaves of the trees are often devoured, by rubbing off the larvæ with the hand, and afterwards watering the trees well with soft water, such as that of ponds or other exposed situations.

The sixth, or coccus, also belongs to the same order, and the males have wings, but the females none. It may be noticed, that the sorts most commonly met with when full grown, have somewhat the form of a boat with the keel uppermost, being apparently without feet, eyes, &c. while in this state resembling some sorts of galls or excrescences of the bark of trees or other plants.

It has been observed by Mr. Forsyth, that a "thin film, of a white cotton-like substance, is interposed between the flat part of the body and the tree. This is common, in a greater or lesser quantity, to all the species, and appears at first all round the edge as a kind of cement, to join it to the tree. The males are very few in proportion to the females, and not nearly one-fourth of their size; they are beautiful little flies, which, after a short but active life, terminate their existence without having tasted food, being provided with no sort of organs for that purpose."

It is likewise remarked, "that the peach, nectarine, and pear-tree, are very much infested with these insects: they frequently cut through the bark, and the trees then appear as if they had been scratched by cats." He has "seen some with this appearance all over them."

It is advised, that, "when these insects first appear on the bark, they should be scraped off with a wooden knife, and the stem and branches of the tree well washed with soap-suds and urine, applied with a stiff painter's brush. This should be done in February before the buds begin to come out. But if the outer bark is perforated, it must be cut or scraped off with a long knife; and if you find any brown spots in the inner bark, they must be carefully cut out. This disease is, it is supposed, one great cause of the canker, and of the death of the tree."

And it is added, that "when this disease has made its way through both barks, as is often the case, the branches on each side of the tree may be cut close to the stem, if it has an upright one; but if the tree be trained fan-fashion, the best way is to head it near to the place where it was grafted." He states, that he has "headed old pear-trees which were so dead, except a small strip of live bark on one side, that you might rub the bark off them as easily as off a bundle of faggot-sticks that had been cut upwards of a year; yet these trees have shot out fresh branches to the length of seventeen feet in two years, and produced fine fruit the second year." It is advised to apply the composition immediately after heading or cutting, or paring off the diseased bark. See COMPOSITION.

It is further remarked, that "a very destructive species of the coccus tribe has done incredible damage to the apple-trees in the nurseries and gardens in the neighbourhood of London. Some nurserymen have lost several thousand apple-trees in one year. These insects attach themselves to their bark by their suckers, and by feeding on the juices of the tree, rob it of its nourishment. Such trees as are infested with them have a sickly appearance. These insects generally make their nests where branches have been cut off, or in hollow

hollow places, where the canker has eaten holes in the trees. Their first appearance is like a white down; on touching or rubbing them they tinge the fingers of a crimson colour, like cochineal. If suffered to remain long on the trees, they take wing, like aphides."

It is stated, by the same author, that the method that has been followed for these ten years to destroy them, is to "rub the places where their nests are with an old brush, such as painters use, till they are all cleaned off; and if the part be canker-eaten, to cut it clean out with a knife or chissel; he then takes of soap-suds and urine equal parts, and with this he washes the wound and the bark all round it; and with a brush applies the composition, mixed with wood-ashes and the powder of burnt bones, covering the wound all over with it. Afterwards he shakes some of the powder of wood-ashes and burnt bones, mixed with an eighth part of unslacked lime finely powdered and sifted over the hollows, or where knobs have been cut off."

And it is advised, that "at the same time that the trees are cleared of the cocci, the caterpillars should be picked off."

The writer remarks, that "the first time that he observed the new coccus which has done so much mischief to the apple-trees about London, was in a garden of his own at Chelsea, about the year 1782 or 3; and as far as he can learn, they were imported among some apple-trees, by the late Mr. Swinton of Sloane-street. Mr. Swinton afterwards removed his nursery to the King's Road near Chelsea college, which now goes by the name of the Foreign Nursery."

By some, train oil has been tried, laid on with a painter's brush, but without effect.

The seventh sort, or earwig, is often very destructive to fruit, particularly that of the peach kind. The method recommended by Mr. Forryth for destroying them, and which he has long pursued with success, is to "take old bean-stalks, and cut them about nine inches long, tying them up in small bundles with some pack-thread, or with small yellow willows, and hanging them on nails against the wall, at different parts of the trees. The first thing in the morning, being provided with a board about eighteen inches square, and a small wooden trowel, take down the bundles of bean-stalks one by one, strike them against the board, and with your trowel kill the earwigs as they fall out of the stalks. If you follow this up every morning, (or every other morning,) you will be able to keep them under," without much difficulty.

It is suggested, that this method answers for any sort of trees infested with earwigs. In some years the writer has "seen a great part of the fruits, especially the smooth-skinned sorts, destroyed by these insects, and a small green caterpillar; and in a scarce year of fruit, the leaves of peaches are frequently destroyed by them." It is advised, that "the shreds taken from trees that have been unnailed in autumn, should be soaked in boiling hot soap-suds for three or four days previous to their being used again; as this will kill the eggs of earwigs and other insects that may be deposited on them."

The eighth, the papilio or butterfly sort, belongs to the order lepidoptera.

There are a great many species of this genus, mostly distinguished by the colour of their wings. The more common sorts, with their caterpillars, are well known; and Mr. Forryth advises, that the caterpillars and chrysalides should be carefully picked off, and the trees well watered with clear lime-water and tobacco-water mixed well together. The ninth, the phalæna or moth kind, are extremely numerous, their caterpillars differing much in size, shape, and colour. After casting their slough several times, all of them

spin their cod, in which they are transformed to chrysalides. In this state they are often found rolled up in the leaves of fruit trees, especially those of the pear, plum, and cherry kinds. See PHALÆNA.

And of the sphinx, or hawk moth kind, there are a vast number of species. Their caterpillars apply the hinder parts of their bodies to the branches of the trees, holding the rest erect; hence the name. But in general they spin their cod under ground. They appear early in the morning, or after sun set, flying heavily, and making a sort of noise. Several of the caterpillars are green, and some brown, yellow, spotted, or belted.

The phalæna nutria, or lackey moth, deposits its eggs in rings or circles round the branches of fruit trees, having the appearance of a necklace. See PHALÆNA.

The tenth sort, or thrips, belongs to the order hemiptera, and there are several species. It is extremely small, so as scarcely to be discovered. This insect produces great mischief on fruit trees, devouring the fruit as well as the leaves. It is capable of being destroyed in a similar manner to that of the cocci.

But the nature of the various effects of these different insects, and the means of removing them, will be more fully considered and explained, in describing the several vegetable diseases that are produced by the attacks of different sorts of animals of this kind. See VEGETABLE Diseases.

INSECTS, *Petrified*, in *Natural History*. The works of the earlier writers on extraneous fossils, contain accounts of various insects said to be found in the earth. Mr. William Martin, a late and correct writer on this subject, seems, however, to doubt, whether the remains of any of the winged tribe of insects have been found enveloped in the strata; although such insects in a perfect and natural state of preservation are very common in pieces of amber. The limestone of Oening is said by M. Werner to produce specimens of the larvæ of the libellula or dragon-fly, and of the nepa or water-scorpion. Insects without wings, of the cancer, monoculus, and oniscus genera, are not uncommon in some strata. In his "*Petrificata Derbiensia*," Mr. Martin describes and figures (tab. 45.) an insect found in the shale limestone of Ashford and Bakewell Moor, which he calls the Derbyshire oniscite, and expresses an opinion, which seems pretty well founded, that it differs essentially from the oniscite of the Dudley and Coalbrook-dale lime quarries. He also figures and describes a lunated monoculite, said to be found in iron-stone, near Mansfield, in Nottinghamshire, but this probably is a mistake, particularly if others of the same kind were found near Chesterfield in Derbyshire. The late ingenious Dr. Woodward had persuaded himself, that all the many flies and insects preserved in amber, were of the vernal tribes, and concurred with other fossil subjects in proving, that the Mosaic deluge happened in the spring season of the year: later and more correct observations seem, however, to prove, that all the organic remains of the strata, and even most of those of the alluvia, cannot have relation to that event, since they differ essentially from the recent insects, animals, &c. to which they have a resemblance, and all such seem rather to have been created and lived, during the successive creation and deposition of the mineral substances, composing the strata in which they are imbedded, and long prior to the creation of the present race of animals and vegetables, of whose origin Moses has given us so succinct and satisfactory an account, as according with the present appearances of nature.

INSERTED COLUMN. See COLUMN.

INSERTION, a term frequently used, in *Anatomy*, to signify the implication of one part within another.

The insertion of the bones, muscles, and nerves in the members of an animal, is exceeding artful: the vena cava has its insertion in the right ventricle of the heart.

INSERTION is also used, in *Agriculture*, for the inclosing a graft within the cleft of a tree. See *GRAFTING*.

INSESSUS, or INSESSIO, in *Medicine*, a kind of half-bath or femicupium, usually prepared with a decoction of several herbs proper for the lower parts, wherein the patient sits down to the navel.

It has several uses; as the easing of pain, softening the parts, dispelling a flatulent matter, and frequently promoting the menses.

INSHILLA, in *Geography*, a town of Africa, near the E. coast of Tunis; 108 miles S. of Tunis.

INSIDE GUARD, in *Fencing*, a guard with the broadsword, to secure the face and front of the body from a cut made at the inside of the position, above the wrist. See *GUARD*.

INSINUATION denotes a cunning, and covert way of creeping into any person's favour.

INSINUATION of a will, among *Civilians*, is the first production of it, or the leaving it with the register, in order to its probate. See *WILL*.

INSIPID, TASTELESS, that which has nothing in it pungent enough to affect the palate, tongue, &c. and to occasion that sensation we call *tasting*.

INSITION, INSITIO, in *Botany*, denotes the same with engraving; viz. the act of inserting and uniting a cion, bud, or the like, in the substance of the stock.

INSOKO, in *Geography*, a town of Africa, on the Gold Coast; 120 miles from the sea.

INSOLATION, in *Medicine*, from *in* and *sol*, the sun, a term used by some writers to express the disease, occasioned by the direct action of the sun's rays upon the human body, which has been called, in the Latin and French languages, *ictus solis*, and *coup de soleil*. See an account of this disorder under the head *HEAT*, in *Medicine*.

INSOLATION, in *Pharmacy*, a method of preparing certain fruits, drugs, &c. by exposing them to the heat of the sun's rays; either to dry, to maturate, or to sharpen them, as is done in vinegar, figs, &c.

The word comes from the Latin verb *insolare*, which is used by Pliny and Columella; and signifies to *expose to the sun*.

INSOLVENCY, *Act of*, in *Law*, an occasional act, frequently passed by the legislature; whereby all persons whatsoever, who are either in too low a way of dealing to become bankrupts, or not being in a mercantile state of life are not included within the laws of bankruptcy, are discharged from all suits and imprisonment, upon delivering up all their estate and effects to their creditors upon oath, at the sessions or assizes; in which case their perjury or fraud is usually, as in case of bankrupts, punished with death.

INSOLVENT, a term applied to such persons as have not wherewithal to pay their just debts.

A person dying, and not leaving estate sufficient to discharge these, is said to die insolvent.

INSPECTING *Field-officer of a District*, in *Military Language*, denotes an officer, selected from the line, and nominated by the War-office, to superintend and to vouch for the faithful distribution of monies which are issued to officers acting on detachment, or on recruiting parties, within the limits of his station.

All district pay-masters are strictly enjoined by the last general regulations to get their muster-rolls and pay-lists duly authenticated, not only before a justice of the peace, but to have them witnessed by the inspecting field officer. All the

recruiting officers, &c. within the limits of the district are accountable and subordinate to the inspecting field officer. It is the duty of the latter to be particularly minute in his examination of every thing which appertains to the recruiting service. They have the command of all recruiting parties of regiments of cavalry and infantry in their districts; they are authorized to give an intermediate approval of the recruits whom they judge fit for service, except in cases where regiments are so quartered, as to render it, in point of distance, equally convenient for the recruits to be sent to their own head quarters. The senior officer in each quarter is ordered to report to the field officer of the district. No officer is to leave his station even for one day, without reporting to the field officer who has the command of the recruiting parties in the district, or to be absent from it for more than one day, without the previous permission of the field officer. The field officers in their districts, are to be responsible for the dress, regularity, and good conduct of the officers, non-commissioned officers and private men of the several recruiting parties under their command. They are constantly to wear their uniforms, whilst in their districts, and they are to see, that his majesty's orders respecting the due observance of discipline, regularity, and uniformity of appearance among the officers, non-commissioned officers and privates, be strictly and unequivocally adhered to.

Field officers of districts may order detachment courts martial, to be composed of the recruiting officers in their districts, in the usual number and ranks, and they are to approve of every such court martial, and to direct the punishment awarded thereby to be executed, mitigated or remitted, as they shall think expedient. They are to receive orders from the inspector-general of the recruiting service, respecting the nature of their returns; and all returns and reports are to come to the inspector-general through them. Each district field officer has an allowance of ten shillings a day, in addition to the full pay of his respective regimental rank, and he is to be reimbursed for the actual expence he incurs for stationary and postage of letters; which charge must be accompanied by a certificate upon honour.

Each district field officer is allowed to appoint a subaltern officer (not employed upon the recruiting service) to act as adjutant in the district. The pay or allowance of such subaltern is three shillings a day in addition to his full regimental pay; he is also authorized to nominate two sergeants, with the additional pay of sixpence each, one to act as serjeant major, and the other as clerk to the district.

Each field officer may moreover give directions to the hospital mate, who is placed under his orders, to examine the recruits when brought for inspection, and to give such medical assistance as may be in his power, to the several recruiting parties in the district he belongs to.

When colonels of regiments take upon themselves the whole direction of the recruiting service for their own corps, they must conform to the regulations which require returns to be made to the inspector-general of the recruiting service; and they must instruct their officers to send weekly returns to the regulating field officer, in whose district they are stationed, of all the casualties that have occurred. See pages 105, 106, 107, and 118 of the General Regulations.

INSPECTION denotes examination, survey, and superintendence of general, regimental, and company duties. A general inspection is made annually by the reviewing generals of districts. Every regiment, on this occasion, is minutely looked into, and a faithful account must be delivered by each commanding officer of the actual state of his regiment, together with all the casualties that have occurred during the current

current year. The inferior economy of the corps is not only investigated to the bottom, but the discipline of the men is likewise examined. For a more particular explanation of the latter, see REVIEW.

INSPECTION, Regimental, is made once a month by the commanding officer. The clothing, the necessaries, arms, and accoutrements belonging to the different companies are examined by the lieutenant-colonel or major of the corps. Specific returns are made by the officers commanding troops or companies, by whom the debts and credits of the men, which have been made up and accounted for on the 24th day in each month, in infantry regiments, and on the 24th day in each second month in cavalry corps, are exhibited for examination at head quarters. This forms the ground-work or basis of the general inspection, at which the troop or company book should always be produced.

INSPECTION, Private, of Companies, is the first step towards the other two, and ought to be made every Monday morning, by each officer commanding a troop or company, or by his subaltern.

INSPECTION of Necessaries is an examination of the different articles which every soldier is directed to have in good repair. The regular or established proportion of necessaries that each soldier of cavalry and infantry is to be in possession of on the 24th day of each month, to entitle him to receive the balance that may be then due to him, consists of the following articles.

Cavalry.—3 shirts, 2 pair of shoes, 3 pair of stockings, 1 pair of gaiters, 1 forage cap, 1 saddle-bag, 1 pair of canvas, or woollen over-hose, 1 canvas, or woollen frock or jacket, 1 stock, 1 black-ball, 2 brushes, 1 curry-comb and brush, 1 mane comb and sponge, and 1 horse-picker.

Infantry.—3 shirts, 2 pair of shoes, 2 pair of stockings, or 2 pair of socks, 1 pair of long gaiters, 1 forage cap, 1 pack, 1 stock, 1 black-ball, and 2 brushes.

INSPECTION, or Examination, Trial by. See EXAMINATION.

INSPECTOR-General of Cavalry, a general officer, whose particular duty is to inspect all cavalry regiments, to report the state of the horses, and to receive specific accounts from the different corps of their actual state; he communicates with the commander-in-chief, and whenever a cavalry regiment is ordered to be disbanded, it must be looked at by the inspector-general before it is finally broken.

INSPECTOR-General of the Recruiting Service, an officer of rank, through whom the field officers of districts, and colonels of regiments (when they personally manage the recruiting service of their own corps) transmit their several returns to the adjutant-general's office. All recruiting parties which are sent to the great manufacturing towns in England and Wales, as also to Scotland and Ireland, must be previously authorized so to do by the inspector-general.

Two field officers have been lately appointed as permanent inspectors of clothing. These inspectors, or the inspectors for the time being, are directed to view and compare with the sealed patterns, the clothing of the several regiments of cavalry and infantry, as soon as the same shall have been prepared by the respective clothiers; and if the said clothing appear to be conformable to the sealed patterns, they are authorized to grant two certificates of their view and approval thereof; one of which certificates is to be delivered to the clothier, to be sent with the clothing to the head quarters of the corps, and the other to be lodged with the general clothing board, as the necessary voucher for passing the assignment of the allowance for the said clothing.

All clothing must be viewed, and certificates be signed by

both inspectors, except in cases where the absence of one of them shall be unavoidable; in all which cases the cause of such absence is to be stated by the other inspector, in his certificate of the view of the clothing.

Inspectors of clothing are to follow all instructions which may be transmitted to them from the commander-in-chief, the secretary at war, or the clothing board.

INSPECTOR of Hospitals, the next on the staff to the surgeon general.

INSPECTOR, a person to whom the care and conduct of any work is committed.

INSPECTORS, in the *Roman Law*, were such persons as examined the quality and value of lands and effects, in order to the adjusting or proportioning taxes and impositions to every man's estate.

The Jews also have an officer, in their synagogue, whom they call *inspector*, *יִשְׁמֵר*, *hshazen*. His business consists principally in inspecting, or overlooking the prayers and lessons, in preparing and shewing them to the reader, and in standing by him to see he reads right; and, if he makes mistakes, he is to correct him.

INSPICIENDO VENTRE. See VENTRE.

INSPIRATION, in *Physiology*, the act of drawing the atmospheric air into the lungs. See LUNG.

INSPIRATION, among *Divines*, &c. implies the conveying of certain extraordinary and supernatural notices, or motions, into the soul: or, it denotes any supernatural influence of God upon the mind of a rational creature, whereby he is formed to any degree of intellectual improvements, to which he could not, or would not, in fact, have attained in his present circumstances, in a natural way.

If a man were instantaneously enabled to speak a language which he had never learned, how possible soever it might have been for him to have obtained an equal readiness in it by degrees, few would scruple to say, that he owed his acquaintance with it to divine inspiration. Or, if he gave a true and exact account of what was doing at a distance, if he published a particular relation of what he neither saw nor heard, as some of the prophets did, all the world would own (if the affair were too complex, and the account too circumstantial to be the result of a lucky guess), that he must be inspired with the knowledge of it; though another account, equally exact, given by a person on the spot, would be ascribed to no inspiration at all.

Thus the prophets are said to have spoken by divine inspiration.

Some authors reduce the inspiration of the sacred writers to a particular care of Providence, which prevented any thing they had said from failing, or coming to nought; maintaining, that they never were really inspired, either with knowledge, or expression.

According to M. Simon, inspiration is no more than a direction of the Holy Spirit, which never permitted the sacred writers to be mistaken.

It is a common opinion, that the inspiration of the Holy Spirit regards only the matter, not the style, or words; and this seems to fall in with M. Simon's doctrine of direction.

Theological writers have enumerated several kinds of inspiration: such as an inspiration of *superintendency*, in which God does so influence and direct the mind of any person, as to keep him more secure from error in some various and complex discourse, than he would have been merely by the use of his natural faculties; *plenary superintendent* inspiration, which excludes any mixture of error at all from the performance so superintended; inspiration of *elevation*, where the faculties act in a regular, and, as it seems, in a common manner,

yet are raised to an extraordinary degree, so that the composer shall, upon the whole, have more of the true sublime, or pathetic, than natural genius could have given; and inspiration of *suggestion* when the use of the faculties is superseded, and God does, as it were, speak directly to the mind, making such discoveries to it as it could not otherwise have obtained, and dictating the very words in which such discoveries are to be communicated, if they are designed as a message to others. It is generally allowed that the New Testament was written by a superintendent inspiration: for without this the discourses and doctrines of Christ could not have been faithfully recorded by the evangelists and apostles; nor could they have assumed the authority of speaking the words of Christ, and evinced this authority by the actual exercise of miraculous powers: and besides, the sacred writings bear many obvious internal marks of their divine original, in the excellence of their doctrines, the spirituality and elevation of their design, the majesty and simplicity of their style, the agreement of their various parts, and their efficacy on mankind; to which may be added, that there has been in the Christian church, from its earliest ages, a constant tradition, that the sacred books were written by the extraordinary assistance of the spirit, which must at least amount to superintendent inspiration. But it has been controverted whether this inspiration extended to every minute circumstance in their writings, so as to be in the most absolute sense plenary. Jerom, Grotius, Erasmus, Episcopius, and many others, maintain that it was not; whilst others contend, that the emphatical manner in which our Lord speaks of the agency of the spirit upon them, and in which they themselves speak of their own writings, will justify our believing that their inspiration was plenary, unless there be very convincing evidence brought on the other side to prove that it was not: and if we allow, it is said, that there were some errors in the New Testament, as it came from the hands of the apostles, there may be great danger of subverting the main purpose and design of it; since there will be endless room to debate the importance both of facts and doctrines.

What has been above denominated *superintendent* inspiration in the language of Dr. Doddridge, Mr. Whitby expresses by inspiration of *direction*: and he thus distinguishes it from the inspiration by *suggestion*. 1. Where there is no antecedent idea or knowledge of the things written for the good of others, to be obtained from reason or a former revelation, an inspiration of suggestion must be vouchsafed to the apostles, in order to enable them to make such things known to the world. But where there is such an antecedent knowledge of the things to be indited, it can only be necessary that God should immediately, or by some special occasions, excite them to indite those things, and should so carefully preside over and direct their minds, whilst writing, as to suggest or to bring into their memories such things as his wisdom thought fit to be written, and should not suffer them to err in the delivery of what was thus written in his name, or as apostles of God the Father and our Lord Jesus Christ. 2. In all their revelations of mysteries, or things which could not otherwise be made known to them, either by natural reason or antecedent revelation, they must be acknowledged to have had them by an immediate suggestion of the holy spirit. 3. As for those things which they did know already, either by natural reason, education, or antecedent revelation, they needed only such an assistance or direction in them, as would secure them from error in their reasonings, or in the confirmation of their doctrines by passages contained in the Old Testament; and therefore a continual suggestion must

be necessary in this case. 4. In writing the historical parts of the Old Testament, or matters of fact relating to themselves and others, it is only necessary, that what is there delivered as matter of fact should be truly performed, as it is said to have been done; but it is not necessary that they should be related in that order of time in which they were performed, unless also that be affirmed of them: for this must be sufficient to assure us of the truth of what they thus delivered. Moreover, in writing the discourses contained in these books, it is not necessary that the very words should be suggested or recorded, in which they were first spoken, but only that the true intent and meaning of them should be related, though in diversity of words; though the promise made to the apostles by our Lord, that the holy spirit should bring to their remembrance all things which he had said unto them, doth fairly plead for this exactness in what they have delivered of our Saviour's sermons; it being scarcely imaginable their memory, without divine assistance, should exactly give us all that was spoken in such long discourses. Lastly, it appears, says Dr. Whitby, that I contend only for such an inspiration, or divine assistance, of the sacred writers of the New Testament, as will assure us of the truth of what they write, either by inspiration of *suggestion* or *direction* only, but not for such an inspiration as implies, that even their words were dictated, or their phrases suggested to them by the Holy Ghost. Dr. Whitby cannot allow, 1. For any slips of memory in the compilers of the sacred books of the New Testament; for though these are allowed by some in matters of small consequence, as they are pleased to style them, yet it is of great consequence that we do not own them: for, if you grant they have slipped at all, by what rules can we affirm that they have not slipped above an 100 times, or even in most of their historical relations? 2. He cannot grant, that the apostles determined any matters of practice merely from rules of human prudence, without the guidance and direction of the holy spirit. 3. Dr. Whitby does not allow that St. Paul doth not always use the best arguments, but such as are best suited to the capacities and notions of those to whom he writes: if so, by what rules shall we be able to distinguish betwixt his arguments, on which we may safely rely, as being absolutely true, and those which are only accommodated to the notions of those with whom he had to do?

Dr. Whitby next proceeds to lay down the arguments which prove, that the apostles were assisted and preserved from error by the spirit of God, and were enabled to deliver to us an unerring rule of faith. These arguments are the following: 1. Their assertions concerning their own writings, and what they say respecting the declarations made, the doctrines delivered, and the directions given in them. 2. The things which God spake to his servants the prophets are styled the things which I command by my spirit. (Zech. i. 6.) But the apostles were thus assisted. Peter says they preached the gospel by the Holy Ghost sent down from heaven; they spake as they were moved by the Holy Ghost; they style themselves prophets and apostles: they challenge a like illumination with the ancient prophets: they pretend to teach others in words taught them by the Holy Ghost. In all these sayings they must have been guilty of a false testimony concerning God, and must impose upon the church of Christ, if no such assistance of the holy spirit was imparted to them. 3. The infallible assistance granted to the apostles is inferred from our Saviour's promise to them, repeated on different occasions. 4. The sacred records were to be a standing rule of faith through all ages; and therefore in all things propounded in them to our faith,

they must contain a divine testimony, or a revelation of the will of God. 5. That the apostles and writers of the New Testament were assisted both in their preaching and writing by the spirit of God, is attested by Christians of all ages from the beginning.

Dr. Benson, in his "Dissertation on Inspiration," published in his "Commentary on the Epistles," and included in bishop Watson's "Collection of Tracts," observes, that many of the difficulties and objections that have been raised concerning inspiration have been very much owing to the mistaken accounts given by some of the friends to revelation. What he takes to be the genuine account, appears, at first view, easy and natural, and also, upon examination, the most unexceptionable. It is this: as Moses retained in his mind the perfect and entire idea of the pattern shewn him in the mount, according to which model he was to make all things; so the apostles, and they alone, had in their minds the full and complete scheme of whatever they were to preach or write concerning the Christian doctrine. And according to that model they were to found and erect the Christian church. Not that they had the whole scheme of the Christian revelation in its utmost extent fully communicated to them at once, the contrary of this is evident; for on the day of pentecost, the twelve apostles of the circumcision do not appear to have received any more than the revelation of that gospel, which they were to preach to Jews only. It was some years after that they had the particular revelation concerning their going to the devout Gentiles, and concerning the gospel which they were to preach to them: and it was a long time before the particular revelation was communicated to the apostles of the uncircumcision, concerning their going among the idolatrous Gentiles, or what gospel they were to preach to them. And finally, different apostles of both classes had, besides the general scheme, different revelations communicated to them. What is meant is this, that they had by immediate revelation the whole scheme of what they were to preach to the Jews, before they addressed themselves to the Jews; and the whole scheme of what they were to preach to the devout or idolatrous Gentiles, before they addressed themselves to devout or idolatrous Gentiles; and that they retained in their minds constantly the complete idea of the whole scheme, after it was communicated to them. From this constant fund of knowledge, they were enabled clearly to determine (as far as any case required) what was, or was not, the Christian doctrine. This revelation of the whole scheme of the religion of Jesus is, as Dr. Benson apprehends, what St. Paul understood by the word of wisdom, which stands first in the order of spiritual gifts; 1 Cor. xii. 18. Though the evangelists and prophets had some of the inferior gifts of the spirit, yet it was what they had received from the apostles, that they were to teach and to commit to faithful men, who were to teach others. The Old Testament prophets were not under a constant divine inspiration, unless we except Moses during the time in which he was erecting all things, according to the pattern shewn him in the mount: but the apostles had this fund of illumination constantly residing within them, from the time of its being communicated to the end of their lives. Christian prophets, being of an order inferior to the apostles, were neither under constant inspiration, nor had they at any time any more than particular revelations, relating to particular cases. Dr. Benson supposes, that the books of the New Testament derive their infallibility from their being written, taught, reviewed, or approved of by some of the apostles, who alone had this fund of knowledge constantly residing in them. Whenever, therefore, they spoke or wrote concerning Christianity, this fund of revelation kept them right. But they were

reasonable creatures as well as inspired apostles, and therefore could speak or write about common affairs, as men that have the use of their reason, without any inspiration, can easily do; instances of which frequently occur. Upon this system, such things only are ascribed to inspiration, as (all circumstances considered) required inspiration; and such things to human reason, as human reason alone was capable of.

It appears by citations from the writings of the primitive fathers, Clemens Romanus, Polycarp, Justin Martyr, Clemens Alexandrinus, Origen, Tertullian, &c., that most of them maintained the plenary superintendent inspiration of the sacred writers, and particularly of the apostles. This kind of inspiration some have conceived necessary to vindicate the credibility of the doctrines and the authority of the precepts which they delivered under a divine commission. Others, however, have objected to this plenary inspiration; and allege mistakes and contradictions which occur in the history of their conduct and in their writings, see Matt. x. 19, 20; Mark, xiii. 11; compared with Acts, xxiii. 1-6. It has been said that the apostles did not seem to apprehend each other to be inspired, as appears by their debating with each other in the council at Jerusalem (Acts, xv.), and by Paul's blaming Peter (Gal. ii. 24.); and it is farther urged, that the Christians in those early days did not apprehend them to be infallible, since their conduct was in some instances questioned and arraigned. (Acts, xi. 2, 3. xxi. 20-24.) It has been also said, that Paul, who asserts himself to have been inferior to none of the rest of the apostles (2 Cor. xi. 5. xii. 11.) speaks of himself in such a manner, as plainly to shew that he did not apprehend himself under such a plenary inspiration (1 Cor. vii. 10. 12. 25. 40. 2 Cor. xi. 17.); nor do we find that any of the apostles introduce their discourses with such clauses as the prophets used, to declare that they spoke as the oracles of God. To this objection, however, it has been replied, that their distinguishing in the cases here referred to seems strongly to imply, that their decisions in other points of doctrine and duty were by "immediate revelation from Christ." It has been also pleaded, against the plenary inspiration above stated, that it is inconsistent with that diversity of diction or style which occurs among the sacred penmen. Is not the style, it is said, of all inspired writers the same, as being the style of the same spirit by which they were alike directed? It is argued on the other hand, that in some sense the style of all those writers is the style of the holy spirit, who spoke by them, and was the same in them all; but that the holy spirit should always employ the same style in conveying celestial truths to men, is no more necessary than that he should always use the same language. We have no reason to doubt that the sacred writers were permitted to employ the style and idiom most familiar to them, in delivering the truths with which they were inspired. So far only were they over-ruled in point of expression, by the divine spirit, that nothing could be introduced tending in any way to obstruct the intention of the whole. And sometimes, especially in the prediction of future events, such terms would be suggested as would, even beyond the prophet's apprehension, conduce to further that end. But this doctrine, it may be said, is liable to an objection from the gift of tongues conferred on the apostles and others for the promulgation of the gospel. In the languages with which those primitive ministers were miraculously furnished, it may be objected they could have no style of their own, as a style is purely the effect of habit, and of insensible imitation. This objection, however, is easily obviated: 1st, as they received by inspiration those tongues only of which they had previously no knowledge, it is not probable, at least it is not certain, that this gift had any place in the writings of the New

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Testament; that in most of them it had not is manifest. But, 2dly, if in some it had, the most natural supposition is, first, that the knowledge of the tongue with which the Holy Ghost inspired the sacred writers, must have been in them precisely such a knowledge, and such a readiness in finding words and expressions, as is in others the effect of daily practice. This is even a necessary consequence of supposing that the language itself, and not the words of particular speeches (according to the notion of Dr. Middleton, in his "Essay on the Gift of Tongues") was the gift of the spirit: And, 3dly, that their acquaintance with the tongues, supernaturally communicated, must have been such as would render their teaching in it best adapted to the apprehensions of the people with whom they would be most conversant, or such as they would most readily have acquired in the natural way. Now on this hypothesis, which on many accounts appears the most rational, the influence of habit, of native idiom, and of particular genius and turn of thinking, would be the same on the writer's style as though he had acquired the language in the ordinary way. Because Cicero and the Greek philosophers were of opinion, that if Jupiter spoke Greek, Dr. Middleton cannot conceive, that a style so unlike Plato's as that of the evangelists, can be the language of inspiration, or be accounted worthy of God. But it was not, we know, peculiar to the Greeks or to the apostolic age to set too high a value on the words which man's wisdom teacheth. See more on this subject in Campbell's Preliminary Dissertations, Diff. 1.

It has been observed, in reference to the subject of inspiration, that our Lord's evangelists report our Lord's discourses with very great variations in their particular expressions; and hence some authors have been led to give up the opinion of the inspiration of the evangelists, as writers. Thus they say, they are able to place the gospel history on the same unexceptionable footing with other credible histories, resting on independent testimonies, in consequence of their agreeing in all matters of importance, and appearing to be independent of each other, by their disagreement in matters of no importance. By this means they also disencumber the evidence of the gospel history of many objections insignificant indeed in themselves, but rendered of the greatest magnitude, and even absolutely insuperable by those who profess to maintain the plenary inspiration of the scriptures. Dr. Priestley is one of those writers who has adopted this hypothesis. He says, however, he is far from denying all inspiration; but only the universal and infallible inspiration of the scripture historians as "writers." When the prophets or apostles worked miracles, or delivered prophecies, and other messages from God, they must have been inspired. Paul also seems to say, that he received his knowledge of the gospel by a personal communication from Christ after his resurrection. (Priestley's Preface to his Harmony.) After all, it should be remembered that our Lord made an express promise to his apostles, that "the spirit of truth should lead them into all truth, and bring all things to their remembrance whatever he said unto them," John, xiv. 26; and this promise seems to warrant that notion of inspiration which we have stated towards the beginning of this article.

Michaelis, (Introduction to the New Testament) after weighing, with all that care and attention which so important a subject requires, the arguments which may be advanced on both sides, thinks it advisable to divide the question. To the pistles, inspiration is of real consequence; but with respect to the historical books, viz the Gospels and the Acts of the Apostles, we should really be no losers if we abandoned the system of inspiration, and in some respects have a real advantage. We should be no losers if we considered the apostles, in historical facts, as merely human witnesses,

as Christ himself has done in saying, "Ye also shall bear witness, because ye have been with me from the beginning." (John, xv. 27.) And no one that attempts to convince an unbeliever of the truth of Christianity, would begin his demonstration by pre-supposing a doctrine which his adversary denies, but would ground his arguments on the credibility of the evangelists as human historians for the truth of the miracles, the death and the resurrection of Christ. Even those who examine the grounds of their faith for their own conviction, must treat the evangelists as human evidence, since it would be arguing in a circle to conclude that the facts recorded in the gospels are true, because they are inspired, when we conclude the scriptures to be inspired in consequence of their contents. In these cases, then, we are obliged to consider the evangelists as human evidence, and it would be no detriment to the Christian cause to consider them at all times as such in matters of historical fact. We find it nowhere expressly recorded that the public transactions which the apostles knew by their own experience, and of which St. Luke informed himself by diligent inquiry, should be particular objects of divine inspiration. We should even be considerable gainers, in adjusting the harmony of the gospels, if we were permitted to suppose that some one of the evangelists had committed an immaterial error, and that St. John has rectified some trifling mistakes in the preceding gospels. The most dangerous objections that can be made to the truth of our religion, and such as are most difficult to answer, are those drawn from the different relations of the four evangelists. Mr. Kiddle, in the beginning of the second section of his "Essay on Inspiration," entertains sentiments similar to those of Michaelis; now, if we advert to the sentiments of Grotius, already recited, and which gave rise to the famous theological disputes between the Dominicans and the Jesuits, will the distinction between the inspiration of the historical books, and that of the epistles, appear to be new? As to the writings of those that were apostles, Michaelis maintains that their inspiration depends on their authenticity. If they are written by the apostles, to whom they are ascribed, we consider them as divinely inspired: if not written by apostles, they can make no pretension to inspiration. But it may be asked, on what argument the position is grounded, that the writings of the apostles, if genuine, are inspired? It is answered, on the testimony of Christ and his apostles, which is credible and sacred, because they have confirmed their doctrines by numberless miracles. But, where is this evidence recorded? It is certain, in the first place, that the apostles must be regarded not only as prophets, but as greater than prophets. (Mark, xi. 9—11.) Again, if we consider Christ's more immediate promises of inspiration to the apostles, we shall find that he has given them, in the most proper sense of the word, at three several periods: 1st, when he sent the apostles to preach the gospel (Matt. x. 19, 20); 2dly, in holding a public discourse relating to the gospel, at which was present a considerable multitude (Luke, xii. 11, 12.); 3dly, in his prophecy of the destruction of Jerusalem. (Mark, xiii. 2. Luke, xxi. 14, 15.) It is true, that when we argue from their inspiration on these occasions to the inspiration of their writings, we draw a conclusion "a minore ad majus," but it is a conclusion to which no rational objection can be made; for if they were to expect inspiration for those speeches and answers, which were only temporary, and in which they appeared rather as advocates than teachers, how much more reason had they to expect inspiration in those writings which were to serve as a standard of faith to posterity? Michaelis conceives, that Christ alluded to the future writings of the apostles, when he said to Peter, "Thou art Peter" (*i. e.* a rock), &c. Another promise, first given to Peter, and afterwards extended to all the apostles,

apostles, occurs in Matth. xvi. 19. xviii. 18. If the authority here referred to was given to the apostles without reserve, it is manifest, that, as often as they appeared as teachers of the gospel, they were attended by a constant inspiration, and of course when they committed the precepts of Christianity to writing; or else, we must have recourse to the hypothesis, that the Deity permitted errors to intrude themselves into the morality of the gospels: this is highly improbable; but whichever hypothesis we adopt, we shall come to this conclusion, that the moral precepts, which are contained in the writings of the apostles, are for us commands of the Deity. Moreover, the promises which were given by Christ in the night preceding his death, of the continual assistance of the Holy Ghost, deserve particular attention; more especially as they are recorded in the gospel of St. John (ch. xiv. 16, 17. xv. 26, 27. xvi. 7—11.), who wrote with a particular view to support the authority of the apostles against the Gnostics. Besides, the apostles assert their own inspiration. Thus St. Paul does, Gal. i. 11, 12. 1 Cor. xi. 23. 1 Cor. ii. 13. xiv. 37, 38; and 1 Pet. i. 12. As to those books of the New Testament, which were written by the assistants of the apostles, viz. the gospels of St. Mark and of St. Luke, and the Acts of the Apostles, Michaelis hesitates in admitting their inspiration. See MARK and LUKE.

Among the heatliens, the priests and priestesses were said to be divinely inspired, when they gave oracles.

The poets also laid claim to it; and to this end they always invoked Apollo and the muses at the beginning of any great work.

INSPISSATING, in *Pharmacy*, an operation whereby a liquor is brought to a thicker consistence, by evaporating the thinner parts.

Thus, juices, as that of liquorice, are inspissated.

INSBRUCK, in *Geography*, a town of Germany, and capital of the Tyrolese, situated on the Inn. The suburbs without the walls are large, and occupied by palaces, churches, and convents. This town is the residence of the supreme representative and aulic chamber, of the revision-judicatory of the counties of the Lower and Upper Austria, and also of the regency or lords-justices. In the middle of the Franciscan church is a magnificent monument, on the top of which is a metal statue of Maximilian I. in a kneeling posture, surrounded by four others representing the Virtues; and in white marble are exhibited the exploits of that emperor. There are some other costly curiosities in this place. The gymnasium of the Jesuits was converted by the emperor Leopold into an university in 1672, calling it "Cæsareo-Leopoldina;" and in 1745 Maria Theresa presented to it the collection of books, formerly kept at the citadel of Ambras, together with other books out of the imperial library at Vienna. This town was taken by the French in 1805: 28 miles N. of Brixen. N. lat. 47° 16'. E. long. 11° 30'.

INSTALLMENT, a settling or instating a person in a dignity, as that of a chancellor in one of our universities, &c.

The word is derived from the Latin *in*, and *stallum*, a term used for a seat in the church, in the choir, or a seat or bench in a court of justice, &c. though Vossius is of opinion the word is of German origin.

Installment is chiefly used for the induction of a dean, prebendary, or other ecclesiastical dignitary, into the possession of his stall, or proper seat, in the cathedral church to which he belongs.

This is sometimes also called *installation*.

Installation is likewise used for the ceremony, whereby

the knights of the Garter are placed in their rank, in the chapel of St. George, at Windfor; and on many other like occasions.

INSTANT, such a part of duration, wherein we perceive no succession; or it is that which takes up the time of only one idea in our minds.

The schoolmen distinguish three kinds of instants; a *temporary*, a *natural*, and a *rational* instant.

INSTANT, *Temporary*, is a part of time immediately preceding another: thus, the last instant of a day precedes immediately and really the first instant of the following day.

INSTANT, *Natural*, is what we otherwise call a *priority of nature*, which obtains in things that are subordinated in acting: as, first and second causes; or causes and their effects: for the nature of things requires, that if there be a second cause, there must be a first; and that there must be a cause, if there be an effect.

INSTANT, *Rational*, is not any real instant, but a point which the understanding conceives to have been before some other instant, founded on the nature of the things which occasions it to be conceived. For instance, as God has made several things voluntarily, which he could otherwise have let alone; there is a reasonable foundation to conceive God, such as he is in himself, before he had made any of those voluntary determinations: but as there was no real instant when God had not formed any determination, this instant is called a *rational* instant, by way of opposition to an instant of time.

INSTANTANEOUS ACTION. See ACTION.

INSTANTER, *Trial*, in *Law*. See REPRIEVE.

INSTAURATION, the re-establishment, or restauration, of a religion, a church, or the like, to its former state.

The word is by some derived from the old Latin *instaurum*, which signified the stock of things necessary for the tilling and managing of grounds; as cattle, tools, harness, &c. The word *instaurum* is only of the middle age; but *instauratio* is of much greater antiquity, and by some is derived from *instar*, like; as importing a thing's being brought to its former likeness or appearance.

INSTEP, in the *Manege*, is that part of the hinder leg of a horse that corresponds to the shank in the fore-leg, extending from the ham to the pastern joint.

INSTERBURG, in *Geography*, a town of Prussian Lithuania, containing two churches, about 350 houses, and 3000 inhabitants. The principal articles of its trade are corn and beer; 44 miles E. of Königsberg. N. lat. 54° 35'. E. long. 22° 21'.

INSTINCT, a natural disposition, or sagacity, where-with animals are endued; and by virtue whereof they are enabled to provide for themselves, and know what is good for them, and are determined to preserve and propagate their species.

The term *instinct*, however, has been variously explained and defined. Instinct, according to Dr. Reid, is a natural blind impulse to certain actions, without having any end in view, without deliberation, and very often without any conception of what we do; and he considers instinct as one species of the mechanical principles of action, the other being habits. An ingenious writer, of whose observations we avail ourselves in the compilation of this article, defines instinct to be a tendency implanted in the minds of animals, when under the influence of certain feelings or sensations, to perform spontaneously, unerringly, independently of all teaching and experience, and without any determinate view

to consequences, certain actions necessary for the preservation of the individual and the continuation of the kind.

Instinct in brutes bears some analogy to reason in men. There have been many systems adopted to explain the principles which produce and direct the spontaneous actions of brute animals.

Many of the ancient philosophers ascribed to brutes an understanding differing only in degree from that of man, and attributed their inferiority to the want of proper and sufficient bodily organs. This system has been very strenuously supported by M. Helvetius, de l'Esprit, tom. i. p. 2. &c. Among the moderns the learned Cudworth endeavoured to explain the instinct of animals, by means of a certain plastic nature. Des Cartes thought that all the actions of brute animals might be explained by the simple laws of mechanism, and considers them as machines totally devoid of life and sentiment, but so curiously constructed by the Creator, that the mere impressions of light, sound, and other external agents, on their organs, produced a series of motions in them, and caused them to execute those various operations, which had before been ascribed to an internal principle of life and spontaneity. But the actions and manners of animals, which are totally incompatible with the mere principles and laws of mechanism, evince the absurdity of this opinion. The dogma of Des Cartes is said to have been first introduced by Pherecydes, the master of Pythagoras; and though Des Cartes had the merit of developing and applying this hypothesis, the doctrine was before published by the Spaniard Pereira. M. Buffon adopts the opinion of Des Cartes in part, but grants brute animals life, and the faculty of distinguishing between pleasure and pain, together with a strong inclination to the former and aversion from the latter. By these inclinations and aversions he undertakes to account for all, even the most striking operations of animals; affirming, that, in consequence of impressions made on the brain, by means of the sensitive organs, and by the re-action of the brain and nerves on the muscles, these machines acquire a motion conformable to the nature of the animal, and of the impressions of the different objects which act upon their organs, and excite desire or aversion. See BRUTES.

The pre-established harmony of Leibnitz has also been applied to explain the actions of brute animals. Others have considered the actions of animals as produced by the constant and immediate influence of the divine energy, directing all their inclinations and motions: such appears to have been the opinion of Mr. Addison, in the second volume of the Spectator. The late ingenious Hermann Samuel Reimar, professor of philosophy at Hamburgh, has enumerated and exposed these and other opinions, with regard to the instinct of animals, in his Observations Physiques, &c. published in two vols. 12mo. at Amsterdam and Paris, 1770: and, defining instinct, in the most comprehensive sense of the word, to be every natural inclination, accompanied with a power, in animals, to perform certain actions, divides instincts into three heads. The first, which he calls *mechanical instincts*, belong to the body considered as an organized substance, and are exercised blindly and independently of the will of the animal. Such are those which produce the motion of the heart and lungs, the contraction and dilatation of the pupil, digestion, &c. This class of instincts is possessed in common both by men and brutes, and in some measure even by vegetables. The second class comprehends those which he terms *representative instincts*, which consist partly in the power of perceiving external objects by their present impression on the senses, and partly in the faculty of rendering the ideas of these objects pre-

sent to the mind by the powers of imagination, or of memory, in a lax sense of the word. These are common to men and other animals, excepting that brutes possess only the faculty of imagination in common with us, and not that of memory, in the strict and proper sense of the word. Indeed this author endeavours to prove, that the knowledge of brutes does not merely differ in degree from that of man, but that it is of a kind entirely different from it; and that they are incapable both of memory and reasoning: the faculty of imagination serving to give them a confused idea of events that are past, by the view, or other impressions of objects that are present. The third and principal class of instincts is that which comprehends all those which M. Reimar calls *spontaneous*. This species of instinct is not attended with any power of reflection, determining the animal to decide freely between two different modes of action present to his imagination; nor is it merely corporeal or mechanical. It is put into action by the natural and primitive principle of self-love, implanted in all animated beings; or by a love of pleasure and aversion to pain, producing a voluntary inclination to perform certain actions which tend to their well-being and preservation. To the performance of these actions they are particularly prompted by their present sensations, by imagination supplying the place of memory, and by other causes. The wonderful effects produced by these instinctive appetites, are farther to be attributed to the exquisite mechanism in their bodily conformation, particularly in the structure of the various organs with which they execute their operations, and to the superior perfection and acuteness of their external senses, by which they are quickly and distinctly informed of those qualities of objects which most materially concern them. In order to account for the more curious and surprising operations of brute animals, M. Reimar adds two other principles, *viz.* 1st, an internal distinct perception of the precise power and proper use of their various bodily organs, together with an innate knowledge of the qualities of those objects around them in which they are interested; and, 2dly, certain innate and determinate powers and inclinations, impressed by the Author of nature, *à priori*, on the soul itself; by which they are arbitrarily, and without their own knowledge or consciousness, directed and irresistibly impelled to the performance of these various operations which they execute with such unremitting industry and art. These determinate forces, which constitute the principal part of M. Reimar's system, are no where so visible and distinguishable as in that numerous set of instincts which he classes under the title of the *industrial* instincts of animals. For a farther account of this system we must refer to the work itself, or to an abstract of it, with several of the author's illustrations, in the Monthly Review, vol. xlv. p. 533, &c.

The majority of philosophers, even in Des Cartes's time, maintained, that the actions of the brutes were mostly *instinctive*, and not mechanical. This prevailing sentiment was altered a little by a wrong application of the principles of Locke. But the balance was soon afterwards restored to its former preponderance in behalf of *instinctive* principles, by the writings of lord Shaftesbury and Dr. Hutcheson; and still more particularly by those of Dr. Reid. Some authors, who, with Locke, reject innate notions and innate principles, both speculative and practical, allow that the mind acts sometimes *instinctively*; others, who reject Locke's ideal theory altogether, detail a great number of instinctive principles of mind; whilst a third class of writers will have the actions, that have been generally denominated *instinctive*, to be either habitual, associated, or mechanical. Nor does the matter rest here: for some authors of a very modern date go so far even

as to maintain that the word *instinct* is unphilosophical; since all that has been referred to this principle, whether in man or in the brutes, may be the result of experience, or of imitation.

Some writers confound the actions that have been generally deemed *instinctive* with those that spring from *reason*; some with those that spring from *mechanism*; and others with such as spring from *habit* and *association*. But it is easy, we think, to distinguish them from each and all of these, by pointing out actions which differ from such as are called *rational*, *habitual*, or *mechanical*. An action is called *rational* when it is performed under the influence of a *motive*; that is, with a view to consequences: Thus, to worship the Deity for having created us, for his goodness towards us, and that he may reward us hereafter, is a *rational action*. Some are of opinion that the *motive*, or the end we have in view in our *rational actions*, is the cause of these actions; but for our part, as we think that the human mind can act not only in opposition to the strongest *external motive*, but against all external motives whatever, *properly so called*, we cannot help thinking it more correct to call them simply *inducements*, and to consider the mind itself solely and properly as the *cause*. *Mechanical* actions also have a cause as well as those that are *rational*; namely, *mechanism* or *organization*. But this cause is not an end proposed, or a *motive*; neither is it an inward feeling, disposition, or sensation: Thus a clock goes through its course of hours, minutes, and seconds, without a view to consequences, without *spontaneity*, and even without being able to check its own action. To this class belong the actions of the heart and arteries, the vermicular action of the intestines, and those of secretion and respiration in animals. *Instinctive* actions may be traced to a cause as well as both the preceding; but this cannot be referred to the class of *motives*, as they are not performed with a view to consequences; neither can the cause be said to be *mechanism*, as they are accompanied with *spontaneity*. The proper cause, however, is the *internal feeling, sensation, or disposition*, that leads to the performance of them, without design or intelligence, on the part of the animal. Thus an infant, in a few minutes after birth, seeks the breast without any knowledge whatever of its necessity for his preservation; and a pair of young birds, without teaching or experience, build their first nest with as much skill and exactness as the oldest of their tribe could do; and that, too, of the customary materials of their species, and in the situations best calculated for depositing and hatching their eggs. *Instinct* and *mechanism* have been oftener confounded with each other, particularly of late, than any other of those principles of action which we are considering; and yet we cannot help thinking that the distinction between *habit* and *instinct* will not appear as palpable as those we have already made, particularly as some *habits* are formed at so early an age that it is very difficult to ascertain whether the actions that spring from them are from *habit* or from *nature*. But supposing such a principle as *instinct*, such as we have described it, the actions that spring from it must differ from such as are habitual in this, "that the former must be from *nature*, and the latter *acquired*." Habit has been defined to be a facility of doing, and not only a facility, but also a proneness to do certain things from having done them frequently before. This definition, however, is manifestly not applicable to *habits of art*, but only to such as can be properly called *principles of action*. (See HABIT.) Instinctive actions agree with habitual ones of the latter kind in this, that they are both performed without intelligence, will, or design; and this has accordingly induced Dr. Reid to confound them, and to class them, very improperly we think, under the head of mechanical actions.

Their agreeing in a few particulars could not warrant him in reducing them to the same class, particularly when he tells us himself, that "the origin of one is natural, of the other acquired." But, besides this, the habitual actions of man seem to want altogether that *spontaneity* which we observe in the instinctive actions of the other animals; such as nest-building, for instance, and the operations of bees, described in a subsequent part of this article, or the migrations of birds of passage "through the pathless air without chart or compass." One instance of an action confessedly habitual will illustrate this more fully. Let us take that motion of the eye-lids which occurs almost every instant. This action cannot be the necessary result of mechanism, as we see that children do not, for some days after birth, close their eye-lids on the approach of external objects. But as soon as some object (suppose too much light) has made them feel inconvenience or pain, and thus produced a voluntary or mechanical motion of the eye-lids, this effect becomes gradually so intimately associated with its cause, that even the appearance of the candle will produce the effect. And, finally, habit gives us so great a proneness to this action, that we perform it constantly, amidst all our occupations, without consciousness, will, or spontaneity; and even without perceiving that, in every waking minute of our lives, we are several moments totally in the dark. And so far is this motion from being a voluntary act, that it requires a strong exertion of will and attention to check it, even for a short time; but do what we will, we can never check it altogether. To avoid being misunderstood, it will be necessary to illustrate more fully the distinction between *habits of art*, in which we acquire a facility only from frequent practice, such as playing expertly on the violin or harpsichord, and those *habits*, which, besides a facility, induce also a *proneness* to act; for instance, in that motion of the eye-lids just described, and many other awkward motions and habits learned from bad example and bad company. This is the more necessary, as it has not been illustrated sufficiently by any author with whom we are acquainted; and forcibly calls to our recollection the words of a French writer, who remarks: "Tout se tient dans un certain ordre de spéculations: Voulez vous développer une vérité? Il faut en éclaircir vingt autres, qui l'avoisinent, et dont la lumière vient, pour ainsi dire, l'éclairer par réflexion." Habits of the latter kind may be properly called *principles of action*; *habits of art* cannot. These require thought, attention, and will in the performance of their operations; whilst the others require no small exertion of thought, attention, and will to check them. Nor can they, even thus, be completely overcome, until, by repeated exertions, a counter habit is established, which is the best way to obviate their effects. It was this that made Dr. Reid say, "I conceive it to be a part of our constitution, that what we have been accustomed to do we acquire not only a facility, but a proneness to do on like occasions; so that it requires a particular will or effort to forbear it, but to do it requires, very often, no will at all. We are carried by habit, as by a stream in swimming, if we make no resistance." Dr. Reid distinguishes these two species of habits as we do; but in some passages he seems to confound them, for he classes them and *instinct* under the head of mechanical principles. Thus, he says, "Habit differs from *instinct*, not in its nature but in its origin; the latter being natural, the former acquired. Both operate without will or intention, without thought, and therefore may be called mechanical principles." (See HABIT.) From both these passages it would seem that he meant habit in general; for the assertions are not qualified in any shape. If such was his opinion, his doctrine agrees exactly with that of Dr. Hartley, whose language affords

no opportunity for being in doubt about his meaning. But, for our part, we cannot help thinking it more philosophical to admit any possibly conceivable rapidity in our intellectual operations, than to suppose, that any action performed with so much correctness, and with such rapidity, as violin and harpsichord playing in some instances, can be merely habitual, or automatic ; that is, in every one of its minute sub-divisions altogether unconnected with the exertions of the will. In habits of art, then, we deem it more correct to admit the interference of the will ; but in the other class, which only, because they give not merely a facility, but also a proneness to act, ought to be called principles of action, we see no reason for admitting its interference in any respect. A different opinion seems to be maintained in a late elegant treatise, for whose author we have a high respect. Upon this we shall offer a few remarks ; but we have not as yet done with Dr. Reid. After having attentively examined what he has written on this subject, we do not think that he intended to include *habits of art* in the passages cited above. Surely so correct an observer of nature could not think, that in *habits of art*, such as pin-making and violin playing, we acquire, from frequent doing, "not merely a facility, but also a proneness to do the same thing on like occasions." In all habits of art we acquire more or less of facility, but surely no proneness, as Dr. Reid asserts of the habits he had in view in one of the passages cited above : for who can assert with any truth, that a violin-player feels a particular proneness, or inward impulse, to play upon that favourite instrument, as often as it is presented to him ? And yet he has acquired a facility in playing, from having often played before. The truth seems to be, that Dr. Reid, after stating the distinction of habits already mentioned, threw the *habits of art* into the back ground altogether. This, indeed, is strongly confirmed by the circumstance, that in the essay and chapters to which we allude, he treats only of what can be called *principles of action*, which he defines to be "every thing that incites us to act ;" and particularly when he tells us that *habits of art*, since they give only a facility, cannot with propriety be called principles of action. "Habit," he says, "is commonly defined a *facility of doing a thing, acquired by having done it frequently*. This definition is sufficient for habits of art ; but the habits which may, with propriety, be called principles of action, must give more than a facility, they must give an inclination, or impulse, to do the action ; and that, in many cases, habits have this force, cannot be doubted." It deserves to be remarked, that in this passage he does not say, that habits give a *proneness* (in his own words, an inclination or impulse) to act in *every case*, which he should have done, if he meant to bring habits of art under the observation. He only says, "that habits give an inclination or impulse in many cases ;" which seems to prove, that he meant only "those habits, which may, with propriety, be called principles of action." This opinion is still further strengthened by the following extract : "Aristotle makes wisdom, prudence, good sense, science and art, as well as the moral virtues and vices, to be *habits*. If he meant no more, by giving this name to all those intellectual and moral qualities, than that they are all strengthened and confirmed by repeated acts, this is undoubtedly true. I take the word in a less extensive sense, when I consider *habits as principles of action*. I conceive it, &c." (as quoted above.) In this extract he tells us, that he takes the word habit in a confined sense, meaning only such *habits* as he calls *principles of action*. And he has already told us, that *habits of art* do not come under that denomination. If the latter part only of the paragraph be attended to, it seems to shew that Dr. Reid held the same opinion on this point with Hartley ; but if the

whole be taken together, and interpreted with fairness, and considered in connection with our remarks on the subject, we think it will appear more probable, that Dr. Reid meant only a particular species of habits, those which he calls *principles of action*, and that he did not intend to characterize such habitual actions as violin and harpsichord-playing, as *involuntary* and *mechanical*. It must not be concealed, that professor Stewart of Edinburgh seems to think otherwise of Dr. Reid's meaning ; and that he has proved, partly in consequence of that opinion, that some of our habitual actions are under the guidance of the will. From the preceding remarks it will appear, that our opinion differs not from the learned professor's, if he means only *habits of art* : but if he means to bring the other class of habits under the influence of the will, (as it is probable he does, for he talks of habitual actions in general, and does not even hint at a distinction,) we cannot help thinking, as even analogy itself affords no support to this opinion, that he was swayed too much by an over ardent zeal for premature generalization. It deserves to be remarked, as an additional proof of the fairness with which we have interpreted Dr. Reid's opinion, that he says nothing of *habits of art* in his chapter on habit, except mentioning one solitary instance, merely to shew "the power of habits and their utility ;" whereas he expressly mentions, as belonging to that species which he calls *principles of action*, many "awkward habits in address, motion, looks, gesture, and pronunciation, acquired by frequenting bad company ; to forbear which, when fully formed, a general resolution (he says) is not sufficient." He even affirms, that particular attention is necessary, on every occasion, to resist their impulse, until they be undone by the habit of opposing them ; for *these habits* operate without intention." It is remarked by professor Stewart, on the subject of habitual actions, "that the circumstance of our inability to recollect our volitions does not authorize us to dispute their possibility." To this observation we have no objection ; but when he further contends "that it does not add any force to the objection, to urge, that there are instances in which we find it difficult, or perhaps impossible, to check our habitual actions by a contrary volition ;" we must remark, that this very circumstance, since it has not been obviated, renders the objection insuperable, and the doctrine against which it militates, so far as that relates to the species of habits which we have called *principles of action*, altogether inconclusive. Let any one try, by the most firm and persevering efforts, to check for a short time the most common of all habits, that of closing the eyelids, and he will find, though he may succeed for a few moments, that he cannot do so altogether. Nor is it an answer to this fact to say "that the contrary volition does not remain with us steadily, during the whole operation ; but is merely a general intention, or resolution, which is banished from the mind as soon as the occasion presents itself, with which the habitual train of our thoughts and volitions is associated." For the time requisite for trying this experiment, and being defeated in it, is so very short, that the contrary volition may be easily kept in view, all the while, without its dwindling away into "a general intention or resolution ;" and besides, if the person who tries the experiment, thinks that he is unable to keep up the counter-volition steadily himself, he can easily have an assistant or two, to sit near him, and remind him to keep his thoughts and attention fixed upon the object in view. Some may perhaps urge that this motion of the eyelids is *instinctive* ; but by the learned professor himself it is allowed to be habitual. We may besides remark, that there is a wide difference between our being unable to recollect the volitions, which in this theory are supposed to precede all our habitual actions, and

and that state of mind in which we are not only not conscious of any such volitions, but fully aware that the habitual actions occur, even when we are conscious of having exerted the strongest efforts of volition to prevent them. But to conclude this preliminary, but necessary, discussion, we may, by way of recapitulation, observe, if the exposition we have been giving be correct, that the difference between the four species of actions under one consideration consists nearly in the following circumstances. That *rational* actions are done with *intelligence, will, and design* on the part of the agent; *instinctive* actions *spontaneously*, but with no proper intelligence or design in the doer; *mechanical* actions without will, *spontaneity*, design or intelligence; and *habitual* actions, like mechanical ones, (we mean the habits that may be properly called principles of action,) without spontaneity, design, or intelligence; but differing in this, that they are *accidental* in their origin, and in many instances capable of being checked and even removed by contrary habits; whereas *mechanical* actions, properly so called, are in a manner necessary in their origin (for instance circulation, secretion and respiration in animals), and can never be removed or suppressed altogether, without the destruction of the animal, by any voluntary effort of ours.

As we are of opinion, that the origin at least of some of the actions of man cannot be explained, unless we admit the existence of such a principle as instinct, it becomes necessary to consider some of those actions of the lower animals, which are generally allowed to be instinctive. This step seems the more necessary, as the existence of instinct, even in the lower animals, seems of late to have been wholly denied, since it has been asserted, in a "New System of the Natural History of Animals," published in Edinburgh, in 3 vols. 8vo. by Peter Hill, in 1791; "that the laws of analogical reasoning do not justify the opinion, that the brutes act, on any occasion, absolutely without design." Whilst, on the other hand, it has been maintained by Mr. Smellie, in his "Philosophy of Natural History," "that between reason and instinct there is no difference, and that the reasoning faculty is itself the necessary result of instinct." Nothing can be more directly opposite than both these opinions; and like most extremes, nothing can be more easily shewn to be false. To prove that some of the natural operations of the lower animals are not performed with design, or with a view to consequences, in opposition to the former, many examples will not be necessary; and first, let us attend to the operations of the winged tribe. The youngest pair of birds, it is known, without instruction or experience, build their first nest of the materials commonly used by their species; in situations, whose privacy, &c. render them fit to afford them security, and convenient for incubation and the rearing of their young. It is also certain, that they shew equal skill with the oldest and most practised of their tribe, in the neatness, accuracy, and symmetry of their work. It is further known, whenever the climate or situation, or any change of circumstances renders a change in the structure of nests necessary, that this change is made by all the individuals (young and old) of the same species equally, and that only when such a change is necessary. Thus, "in countries infested with monkeys, many birds, which, in other climates, build in bushes and clefts of trees, suspend their nests upon slender twigs, and, by this ingenious device, elude the rapacity of their enemies." It is moreover certain, that no improvement has been made, within the memory of man, in the art of nest-building, by any tribe, or by any of its individuals. Now the nature of all the arts with which we are acquainted is such, and their history shews us, that they were first invented by some person, and then improved in

the course of time, either by the inventor or by others, and finally brought to some degree of perfection. History and experience also shew, that human arts are best known and practised with most skill and dexterity in general, by those only to whom they have been taught; and that in different ages and countries they all undergo considerable variations. But in the arts of animals we observe no such variations; nor can any individual be pointed out as the inventor, the improver, or the perfecter of any of them; for instance, of nest-building. Each of them is perfectly skilled in the workmanship of its tribe; we do not say that they know the nature and the rules of the different arts which they practise; but that they are acquainted with the mode of working in them to perfection. How many very simple arts do we daily see practised by our species, without being able to practise them, or learn them ourselves. What a long apprenticeship is generally necessary before we can practise even some of the most common and necessary. A peasant spends months and years under his simple roof, and yet is not able often to build such a hut as that he inhabits. Birds require no such teaching or experience: they served no apprenticeships; and yet a pair of young birds kept solitary and sequestered from their infancy, build exactly such another nest as that in which they themselves had been brought into life. But what is the inference to be drawn from these facts? If the natural actions of the lower animals, for instance this of nest-building, be all under the influence of motives, in other words, *rational*, we must conclude, since they are so invariable, either that their workmanship is perfect beyond the reach of improvement, or so imperfect as not to be capable of degenerating. The former of these conclusions cannot be supported, unless it be contended at the same time, that the lower animals have made more early and greater discoveries and advances in the arts and sciences than we have. Nor will the latter be maintained by any man, who considers the structure of a honey-comb, or who reflects, that all the skill of man has never yet excelled the workmanship even of a wren in the structure of such a nest as he builds. However, if the supposition be admitted, the former seems the better inference. But, if this doctrine be true, we must say, that birds are good judges of climate and circumstances; that they know the dangers and advantages resulting from them, and the best methods for obviating the former and securing the latter. We must say, that reasoning shews them the necessity of equality in the structure of their nests; or when, after having been absent for some time, they turn their eggs so as to heat them properly, and at all times equally, we must think, that they know heat, and even an equal distribution of it, to be necessary for incubation. But as none of these can, we think, be affirmed with the smallest appearance of truth, and since those actions of birds are, without teaching, habit, or experience as perfectly performed by the young as by the old, and always so invariable, we must conclude, that in these instances we discover not the reasoning of animals, pointing to consequences and devising means, but the unerring reason and wisdom of Him who made them, and implanted such principles in their constitutions as guide them unceasingly in the performance of their various natural operations, the complete purposes and utility of which He only knows. Our reasoning is confirmed by that of Addison—"What," says he, "can we call the principle which directs every different kind of bird to observe a particular plan in the structure of its nest, and directs all of the same species to work after the same model? It cannot be *imitation*; for though you hatch a crow under a ken, and never let it see any of the works of its own kind, the nest it makes shall be the same, to the

laying of a stick, with all the other nests of the same species. It cannot be *reason*; for were animals endued with it to as great a degree as man, their buildings would be as different as our's, according to the different conveniences that they would propose to themselves." Some birds display a wonderful share of sagacity in the process of incubation and in rearing their young. Without attentive and cautious observation, one would be almost positive, that in every step they are guided by reason. But it is easy to shew that this is not the case. Let us take a very familiar instance: a hen seeks a silent and an unfrequented place for her nest; when she has laid her eggs and began to cover them, she takes care to turn them frequently, that the vital warmth may be communicated to all parts of them. When she is obliged to leave them, in order to procure food, she is sure to return before they have time to cool, which would render them incapable of producing chickens. In summer she will often stay away for two hours; but in winter, when the cold would destroy the principle of life, she stays away a much shorter time. When the birth approaches, with how much nicety and attention does she help the little ones to break their prison. When brought forth, how cautiously does she cover them from the injuries of the weather, provide them proper nourishment, and teach them to help themselves. It deserves also to be remarked, that she forsakes the nest if, after the usual time of reckoning, the young do not begin to make their appearance. Can any thing have a greater appearance of reason and sagacity than all this. "But, at the same time, the hen that has all this seeming ingenuity (which is indeed absolutely necessary for the propagation of the species), considered in other respects has not the least glimmering of thought or common sense. She mistakes a piece of chalk for an egg; and sits upon it in the same manner; she is insensible of any increase or diminution in the number of those she lays; she does not distinguish between her own and those of another species; and when the birth appears of ever so different a bird will cherish it for her own. In all these circumstances, which do not carry an immediate regard to the subsistence of herself or her species, she is a very idiot." None of these instances justifies the doctrine, "that animals, in all their natural operations, act with a view to consequences." To confirm our reasoning and opinion still farther, out of the numberless examples afforded us by Natural History, we shall content ourselves with one, which, if we mistake not very much, is decisive of this question. This we take from the operations of the bee, as it seems to act with a view to consequences, and to be, as was said of the ant, "*haud ignara et non incauta futuri*." Let us attend a little to the structure of a honeycomb. The cells of the bees are equal and similar; and of the three possible ways in which this can be effected, they have chosen the best for holding their honey and rearing their young. The cells are built on both sides: they may then be placed exactly opposite one another, so that two would rest upon the same bottom; or they may be so placed, that the bottom of one will rest upon the point where the partitions meet on the opposite side. This latter mode gives them more strength, and they are accordingly built thus. Further, the bottoms of the cells are not planes perpendicular to the sides, but consist of three planes meeting in a solid angle in the centre, exactly where the partitions on the opposite side cross one another. And it has been demonstrated, that this makes the cells similar without loss of room, and considerably spares both labour and materials. Thus, then, it is shewn, that bees build their cells so as as lose no room; to have no useless partitions; in the strongest possible manner; and with the least possible expence of labour

and materials. All this, as far as geometry and mathematics can shew it, has been rigorously demonstrated by Mr. Maclaurin, and proves them, on the supposition that they act with a view to consequences in this instance, more skilled in both these instances than the most philosophical and learned men; and that too from the earliest ages. But as this is a doctrine too improbable to be insisted upon, we must rather conclude, that the bees, although they act geometrically, understand neither the rules nor the principles of the arts which they practise with such accuracy; but that the geometry in this instance is in the Maker of the bee, "that Great Geometer, who made all things in number, weight, and measure." (Reid's Active Powers of Man, and the London Philosophical Transactions.) Were a man to construct so nice a piece of workmanship as a honeycomb, we should immediately conclude, that he worked according to rule, and understood the principles upon which he proceeded. Is it necessary to remark, that we have no reason whatever for thinking, that bees understand one or the other? In the most complicated works of human contrivance, a man of equal knowledge and skill will comprehend the principles and general design of the artist: but to understand the rules and principles, which are so rigorously adhered to in the constructing of a honeycomb, is, and will always be, beyond the comprehension of the far greatest part of mankind. The few instances of animal *instinctive* operations, which we have now briefly detailed, will, we hope, be sufficient for the present: they correspond fully with our notion and explanation of instinct, and serve our purpose, as well as a million of instances crowded together. But it is objected, that this instinct, which we call a simple, original principle, accommodates itself to circumstances; that it is improved by experience and imitation; that no such accommodation to circumstances can take place without reasoning, or a comparison of ideas; and, therefore, that this principle of the constitution of the lower animals is not *instinct*, but *reason*. The instances to prove that instinct accommodates itself to circumstances are numerous. Birds stay away from their eggs longer in warm than cold weather. The ostrich in Senegal, where the heat is great, neglects her eggs during the day, but sits on them during the night: but at the Cape of Good Hope, where the heat is less, she sits on them both night and day. In countries infested with monkeys, birds, which in other climates build in bushes and clefts of trees, suspend their nests upon slender twigs, and thus elude their enemies. The same species of birds build their nests differently, when climate and circumstances require it. We have numberless instances of this accommodation to circumstances in the pairing instincts of animals. None, it has been observed, ever pair, except those whose young require the nursing care of both the parents. The extent and continuance of the parental care are in the proportion of the wants and helplessness of the young. When the wants of the young cease, the mother withdraws her fondness, and leaves them to provide for themselves; but the love of the parent may be lengthened out beyond its usual time, as we see in birds, which continue to feed their young, if they are tied to the nest, or confined within a cage, or by any other means appear to be out of a condition of supplying their own necessities. This last instance, whilst it very finely exemplifies an accommodating instinct, affords the happiest proof of the guardian care of a kind and parental Providence. In answer to the objection which these facts contain, it may be first observed, that taking instinct, as it is generally defined, to be a principle in the constitution of animals, given them by their Maker, for the purpose of preserving the individuals

individuals and continuing the kind, in other words, a predisposition to perform certain actions necessary for these ends, when incited by certain feelings or sensations, that its accommodating itself to circumstances and situations is no argument against its existence, nor a good proof, that it is the result of reasoning; since *He*, who made it a part of the constitution of his creatures, knows, that the same ends must be often sought by different means, particularly when times, places, and circumstances are altered; and only manifests his wisdom and goodness the more, by constituting this principle of such a nature, as to vary when requisite, and to change only when such a change is necessary. Let us add to this, that did *He* not impart this accommodating property to instinct, it would not produce the effects for which it seems intended; as we know it to be impossible, that similar means should produce similar effects, when circumstances, climates, and situations, are different. Indeed this accommodating peculiarity, so far from being a good argument against it, is a necessary consequence of instinct. The abettors of this principle do not maintain, that the accommodating variations will take place on every occasion. They will occur only where the disadvantages exist, against which the instinct is intended to provide. Instinctive actions take place when certain sensations exist, and when these do not exist, we cannot wonder that the actions do not occur. In the following remarks we follow the learned author of "Ancient Metaphysics," a work, in which we find a just view of the subject of instinct. Before we positively conclude, that no accommodation to circumstances can take place without reasoning, or a comparison of ideas, it may not be irrelevant to consider some of the appearances which the vegetable and inanimate worlds exhibit. If, because the operations of some animals are so artificial, and because they sometimes accommodate their actions to circumstances, we must say, that they reason and compare ideas, we must contend, that vegetables and inanimate bodies do so likewise: we know, that a vegetable reared in a dark cellar, if some light be admitted, will bend itself towards the light: or, if made to grow in a flower-pot with its head downwards, that it will turn its head upwards, according to the natural position of a plant. Can it be maintained, that the plant in either case does what it does from any judgment or opinion, that it is best, and not from a necessary determination of its nature? The facts taken from the inanimate world are equally in point. How shall we account for the phenomena of elective attractions? when one body unites with another, and then, if a third is presented to it, quits the first and unites itself with the other, shall we say that this is the effect of reasoning and of a comparison of ideas, and suppose, that this preference of the one to the other proceeds from any predilection or opinion, that it is better to cleave to one than to the other? What shall we say of the crystallizations and configurations of salts exhibited to us by the microscope, so various and yet so constant and regular? Must we say, that their minute particles reason and compare ideas, because their operations are so various, and, at the same time, so regular and constant? Or, if nobody affirms this, why should we think, that the actions of animals, not more various and surprising, not more constant or regular, than these motions of the salts, should be the result of reasoning and of a deduction of inferences? Should we not rather affirm, as those inanimate substances arrange themselves so regularly, and yet so variously, upon different occasions, in consequence of an original law of nature, that the benevolent Author of all such laws, intending to display his providence and wisdom still more conspicuously in his animal kingdom, bestowed upon

his creatures this accommodating instinct, without which, (supposing that they act instinctively on any occasion) the great purposes of their propagation and preservation could never be attained? This objection, upon which we have been commenting, is contained in the "System of Natural History" already mentioned in this article. The compilers of that work have been carried much too far in their zeal to do away Mr. Smellie's very unphilosophical notions concerning instinct: and, although we have read over their opinions with much attention, we are still at a loss in some parts to comprehend their meaning. Their dissertation on the subject is but short, and yet, we think, they often contradict themselves. One time you would suppose, that they admit such a principle as instinct in the lower animals; at another they seem to reject it altogether. This latter, indeed, seems to be the fairest account of their opinions. What theory they had in view, when they called instinct a *mechanical* principle, we know not. It could not be the exploded doctrine of Des Cartes, nor the equally unphilosophical theory of Buffon, which has been so fully and so ably refuted by Condillac. Perhaps they referred to Dr. Reid's, who, as we have already observed, calls instinct a mechanical principle. We are equally at a loss for their allusions, when they call brutes *insensible instruments* under the influence of instinct, which they denominate a "mysterious influence." None of the advocates for instinct, so far as we know, have ever held this absurd opinion. On the contrary, they all allow them not only *sensibility*, but even *spontaneity*, in their instinctive operations. And, when they are allowed to possess these, we cannot deny them *consciousness*, by which they must know that they are acting. The supporters of instinct assert no more than this, since some of the natural operations of animals are so complicated, and yet so perfect and invariable, that it is irrational, with such evidence as we possess, to suppose them acquainted with the rules of the arts which they practise, or the ends for which they operate. These, however, are known to Him, and perhaps to Him only, who implanted such principles in their constitutions, as direct them unerringly in all their ways. Besides those now mentioned, there are some other mistakes and errors in this work on the subject under discussion. These, however, with one exception, we shall pass unnoticed. The error we mean, and which, indeed, is not peculiar to these writers, is their supposing, that the advocates of instinct deny reason altogether to the brutes. But this opinion is wholly groundless. That some animals display wonderful sagacity and docility, that they even reason on several occasions, is, we think, clear from the most satisfactory evidence. We shall mention a few facts in support of this opinion. On the northern coast of Ireland a friend of Dr. Darwin's saw above a hundred crows at once preying upon muscles: each crow took a muscle up into the air twenty or forty yards high, and let it fall upon the stones, and thus, by breaking the shell, got possession of the animal. A few years ago there was shewn at Exeter Change, London, an old monkey, who having lost his teeth, used, when nuts were presented to him, to take a stone in his hand, and crack them with it one by one; thus, using means, like the crows in the preceding instance, to accomplish his purposes as well as we do. We are told by Linnæus, that the martin dwells on the outside of houses in Europe under the eaves; and that, when it has built its nest, the sparrow frequently takes possession of it. The martin, unable to dislodge his intruding enemy, convokes his companions, some of whom guard the captive, whilst others bring clay, completely close up the entrance of the nest, and then fly away, leaving the sparrow to be suffo-

cated, as the punishment due to his injustice and temerity. This fact is mentioned in the "Amusement Philosophique, &c." of Father Bougeant. There is also an instance of it in the "Gentleman's Magazine;" in which we find also some interesting particulars concerning a raven kept, some years ago, at the Red Lion at Hungerford. The account is, however, too long to be transcribed, although very much to our present purpose. We recollect seeing, a few years ago, a very sensible cat, which, when out at night, would tap regularly at the windows, if the doors and shutters were closed; knowing by experience, that she was often let in at the windows by day. And what is still a better proof of her reasoning and sagacity, she would always tap at the bed-room windows, when disappointed at the others, or when the night was far advanced. A lady with whom we were acquainted, had a tame bird, which she was in the habit of letting out of its cage about her room every day. One morning as it was picking up some crumbs of bread off the carpet, her cat, who always before shewed great kindness for the bird, seized it on a sudden, and jumped, with it in her mouth, upon a table. The lady, alarmed for the fate of her favourite, on turning about, observed that the door had been left open, and that a strange cat had just come into the room. After turning it out, her own cat came down from her place of safety, and dropped the bird, without injuring, if we may so express it, a hair of its head. Cowper's beautiful little poem on the dog and the water lily, gives an amiable instance of the reasoning of the lower animals, which has been so sweetly, and yet with such elegant simplicity, told in verse, that we cannot think of melting it down into the languid coldness of prose. When we see brutes thus using means to obtain their ends, as well as ourselves, must we not conclude that they reason? When the cat watches for hours in silent expectation of her prey; when the hound traverses a wide extent of country in the chase; when the meanest insect that we tread on, drags its wounded frame to a safe retreat; they shew as much perfecting voluntariness as man can boast. No animal manducates its food, or laps its drink, from the mere pleasure of the motions. It uses them as means for an end; and if hunger and thirst were not felt, they would be considered as labours, and would not be performed. "Animals (says professor Stewart, nearly in the words of Mr. Hume,) are left to make some small acquisitions, by experience, as sufficiently appears in certain tribes, from the sagacity of the old, when contrasted with the ignorance of the young; and from the effects which may be produced on many of them, by discipline and education."—"It seems as evident to me," says Mr. Locke, "that some animals do, in certain instances, reason, as that they have sense; but it is only in particular ideas, just as they receive them from the senses. They are the best of them tied up within those narrow bounds, and have not, as I think, the faculty to enlarge them, by any kind of abstraction." The observations which Mr. Locke makes in this part of his work on the faculties of the brutes, as compared with our's, are in general very just and worthy of perusal. But there are several facts, which our limits do not allow us to state, from which it is evident that brutes on some occasions exhibit proofs of the power of abstraction. That an animal can be capable of gratitude and affection for its master, without reasoning, can, we think, hardly be maintained. From the master's protection and kindness, it infers that it is under obligations to him, which it owes not to another. Before concluding our remarks on the reasoning of animals, we may quote one instance of the affection of a dog, which we think has never been surpassed. And we do it the more readily, as the circumstance has been very

poetically described by an author, who, with all his great merits, seldom writes better than upon this occasion. The instance to which we allude is very interesting, from the incident to which it relates, the death of an unfortunate young gentleman of promising talents, who perished, by losing his way, in the spring of 1805, on the mountain Hellvellyn. His remains were found three months afterwards, guarded still by a terrier bitch, that had long been the companion of his solitary rambles. This last circumstance in particular, is very finely alluded to by Mr. Scott, in his little piece on the subject, to which he has given the name of Hellvellyn. As the few instances now stated are sufficient, and speak fully for themselves, we shall not add to the number, nor stop to make any comments upon them. But it has been asked, if we allow reason to the lower animals, in what does the difference between them and man consist? Do their faculties and our's differ in degree, or in kind? To this question we have not the vanity of thinking that we are able to give a satisfactory answer; we may, however, offer a few remarks. We see that animals learn much from experience and observation as well as ourselves. It is thus they learn the nature, or the properties, of the objects that surround them, such as heights, depths, distances, &c. "A horse that has been accustomed to the field, becomes acquainted with the proper height which he can leap, and will never attempt what exceeds his force and ability. An old greyhound will trust the more fatiguing part of the chase to the younger, and will place himself so as to meet the hare in her doubles; nor are the conjectures which he forms on this occasion, founded in any thing but his observation and experience." By training and education we can teach our domestic animals much more than they would ever learn, if left to themselves and their own observation. If we put them in new situations, we see that their acquired knowledge is much increased and improved, and that by a proper and strict discipline we can train them up to a mode of acting directly contrary to their instincts, or natural propensities. If these observations be just, (and we cannot see how they can be questioned,) it follows, that in the lower animals instinct is susceptible of very great and striking modifications. To produce these, however, strict culture and discipline are necessary; without which, we do not think, that their own experience and observation would ever teach them to deviate much from the line of acting chalked out to them by their instincts, or original propensities. And accordingly we agree with a remark of Mr. Hume's, "that though animals learn many parts of their knowledge from observation, there are also many parts of it which they derive from the original hand of nature, which much exceed the share of capacity they possess on ordinary occasions, and in which they improve little or nothing, by the longest practice and experience." Yet, notwithstanding this susceptibility of improvement by culture and education in the lower animals, we can never observe in them any thing approaching to the knowledge and sagacity of man. They do not, like him, heap observation upon observation, they do not improve by the experience of the past, nor manifest any indications of a regard to futurity; their manufactures are always stationary, and all their acquisitions of knowledge perish with the individual. They never learn the arts of man; for instance, though often as fond of artificial heat as we are, not one of them has been ever known to lay a piece of coal or of wood upon the fire to keep it from going out. All this may be owing to their want of language; but it seems strange, that they possess not this art, as some of them seem to have organs of articulation, as perfect as our's. They use means, it is true, for obtaining their ends sometimes; but these in general are very simple and obvious. They reason

son too on some occasions ; but the want of language, or of general signs, puts it out of their power to reason, but on particular facts. The powers of classifying objects, of abstract reasoning, of using artificial signs as instruments of thought and of mutual communication, seem to be almost altogether peculiar to man. From these considerations, and several others, relating both to the intellectual and moral faculties of man, as contrasted with those of the lower animals, it has been inferred, that the regular chain of being every where else observable on our globe, fails entirely here, and that their faculties differ from our's, not in degree, but in kind.

Thus then we see, that animals perform certain operations that are neither *rational*, *habitual*, nor *mechanical* ; and although it cannot be doubted but some of them reason in several instances, still, even from the short details now given, we cannot allow, that their natural operations are performed with a view to consequences. Nor ought the effects of instinct, (the labours of birds and bees for instance) appear extraordinary to us, when we consider what astonishing effects *habit*, which has been happily called "a second nature," enables us to produce. For instance, we need go no farther than reading, writing, and playing upon musical instruments, all of which we learn by great attention, pains, and study ; and most of all, perhaps, correct and quick extemporary eloquence. And surely, when the effects of an acquired principle are so very uncommon, it cannot be deemed strange, that an original principle of the constitution of animals should perform works still greater or more astonishing.

INSTITA, a word used by the chirurgical writers, for a fillet or other bandage of that kind ; and by medicinal writers, for that sort of flat worms bred in the intestines called by many the tape-worm, or flat worm.

INSTITUTE, NATIONAL, of France, was newly organized in pursuance of a decree of the French government, with the advice of the council of state, as follows : I. It is now divided into four classes, viz. 1. Clafs of physical and mathematical sciences. 2. Clafs of French language and literature. 3. Clafs of history and foreign literature. 4. Clafs of the fine arts.

The actual members and foreign associates of the institute, shall be divided into these four classes.

A committee of five members of the institute, named by the First Consul, shall adjust this division, which shall be submitted to the approbation of government.

II. The first class shall be formed of the ten sections which at present compose the first class of the institute, with a new section of geography and navigation, and eight foreign associates.

The sections shall be composed and called as follows :

Mathematical Sciences.	Geometry	- - - - -	6 members.
	Mechanics	- - - - -	6 ditto.
	Astronomy	- - - - -	6 ditto.
	Geography and Navigation	- - - - -	3 ditto.
Physical Sciences.	General Physics	- - - - -	6 ditto.
	Chemistry	- - - - -	6 members.
	Mineralogy	- - - - -	6 ditto.
	Botany	- - - - -	6 ditto.
	Rural Economy and Veterinary	- - - - -	
	Art	- - - - -	6 ditto.
	Anatomy and Zoology	- - - - -	6 ditto.
	Medicine and Surgery	- - - - -	6 ditto.

The first class shall appoint, with the approbation of the First Consul, two perpetual secretaries, one for the mathematical sciences, the other for the physical sciences. The per-

petual secretaries shall be members of the class, but shall not form a part of any section.

The first class may elect six of its members from the other classes of the institute.

It may name an hundred correspondents selected from the learned men of France and foreign countries.

III. The second class shall be composed of forty members.

It is particularly charged with the composition of the dictionary of the French language. It shall examine, with respect to language, the important works of literature, history, and the sciences. The collection of its critical observations shall be published at least, four times in a year.

It shall name from its own body, and with the approbation of the First Consul, a perpetual secretary, who shall continue to be of the number of the forty members which compose it.

It may elect twelve of its members from the other classes of the institute.

IV. The third class shall be composed of forty members and eight foreign associates.

The object of its researches and labours shall be learned languages ; antiquities and monuments ; history, and all the moral and political sciences connected with history. It shall particularly apply itself to the enriching of French literature with the works of Greek, Latin, and Oriental authors, which have not yet been translated.

It shall employ itself in the continuation of diplomatic collections.

It shall name from its own body, under the approbation of the First Consul, a perpetual secretary, who shall be of the number of the forty members which compose the class.

It may elect nine of its members from the other classes of the institute.

It may name sixty correspondents, natives or foreigners.

V. The fourth class shall be composed of twenty-eight members and eight foreign associates.

They shall be divided into sections, described and formed as follows :

Painting	- - - - -	10 members.
Sculpture	- - - - -	6 ditto.
Architecture	- - - - -	6 ditto.
Engraving	- - - - -	3 ditto.
Music (composition)	- - - - -	3 ditto.

It shall appoint, with the approbation of the First Consul, a perpetual secretary, who shall be a member of the class, but shall not be a part of a section.

It may elect six of its members from the other classes of the institute.

It may name thirty-six correspondents, national or foreign.

VI. The foreign associated members shall have a deliberative voice only on subjects of science, literature, and the arts ; they shall not form part of any section, nor interfere in any usage.

VII. The present actual national associates of the institute shall form part of the one hundred and ninety-six correspondents attached to the classes of the sciences, belles lettres, and fine arts.

Correspondents may not assume the title of members of the institute.

They shall lose that of correspondent when they shall be domiciliated at Paris.

VIII. Nominations to vacant places shall be made by each class in which the vacancy happens ; the persons elected shall be confirmed by the First Consul.

IX. The members of the four classes shall enjoy a reciprocal

cal right to assist at the particular sittings of each class, and may deliver lectures when they are requested.

They shall re-unite four times in a year into one body, to communicate their proceedings.

They shall elect in common the librarian and under librarian of the institute, as well as all those agents who belong to the institute in common.

Each class shall present for the approbation of the government, the particular statutes and regulations of its internal police.

X. Each class shall hold one public sitting every year, at which the other three shall assist.

XI. The institute shall receive annually from the public treasury 1500 fr. for each of its non-associated members, 6000 fr. for each of its perpetual secretaries; and for its expences, a sum which shall be fixed every year, upon the demand of the institute, and comprised in the estimates of the minister of the interior.

XII. There shall be an administrative committee of the institute, composed of five members, two from the first class, and one from each of the others, named by their respective classes.

This committee shall regulate in the general sittings prescribed by art. IX. all that relates to the administration, to the general expences of the institute, and to the division of its funds between the four classes.

Each class shall afterwards regulate the application of the funds assigned to it for its expences, as well as all that concerns the printing and publishing its memoirs.

XIII. Every year the classes shall distribute prizes, the number and value of which shall be regulated as follows:

The first class, a prize of 3000 francs.

The second and third class, each a prize of 1500 francs.

The fourth class, grand prizes of painting, sculpture, architecture, and musical composition. Those who shall have gained one of the grand prizes shall be sent to Rome, and maintained at the expence of government.

The above decree was followed by a second, appointing the members of the different classes, and regulating the days of their meeting.

The sittings of the first class are to be held every Monday; those of the second class every Wednesday; those of the third every Friday, and those of the fourth every Saturday.

These sittings are to be held in the same place, and to last from three o'clock till five.

INSTITUTES, *Instituta*, in the *Civil Law*, a book, containing the elements, or principles of the Roman law; and which constitutes the last part of the *corpus juris civilis*.

The institutes are a compendium, or summary of the whole body of civil law, in four books, composed by Tribonianus, Theophilus, and Dorotheus, by order of the emperor Justinian, for the use of young students; who, having the first elements of the whole profession in this little treatise, might the sooner gain a competent knowledge of it without being discouraged by the bulk of the other books.

These institutes proceed, with no contemptible method, from I. "Persons;" to II. "Things;" and from things to III. "Actions;" and the article IV. of "Private Wrongs" is terminated by the principles of "Criminal Law." For an abridged account of these institutes, see Gibbon's *Decline and Fall of the Roman Empire*, vol. vii. See also *CIVIL Law*.

INSTITUTES likewise denote a system of law, or rules in any science.

INSTITUTION, in a general sense, the act of ordaining, founding, or establishing any thing.

Thus we say, Moses instituted the ceremonies of the old law; Jesus Christ instituted the sacraments of the new.

INSTITUTION, in the *Canon and Common Law*, is the act of the bishop, or of one commissioned by him, whereby a clerk, after the patron's presentation has been admitted, is invested with the spiritualities of a rectory, or vicarage: for by institution the care of the souls of the parish is committed to his charge. See PRESENTATION.

The clerk kneels down before the bishop, whilst he pronounces these words of institution (*instituo te rectorem ecclesiæ de A. B. cum cura animarum, & accipe curam tuam & meam*); and the clerk holds the written instrument, with the episcopal seal annexed, in his hand, during the ceremony.

Before the clerk is instituted, he must subscribe the thirty-nine articles of religion, in the presence of the ordinary, or his substitute; and this subscription must be without reserve, exception, or qualification; else his institution is, *ipso facto*, void and null, and the church still vacant. 13 Eliz. c. 12.—At the same time the ordinary requires the clerk to subscribe the other two articles mentioned in the 36th canon about the king's supremacy, and the lawfulness and use of the liturgy: the clerk must also, before institution, subscribe to that part of the declaration enjoined by the act of uniformity, 14 Car. II. c. 24, viz. "I will conform to the Liturgy of England, as by law established."—Before institution, he must also take the oaths mentioned in the first statute of William and Mary, c. 8. instead of the former oaths of allegiance and supremacy, required by stat. 1 Eliz. and then he must take the oath against simony, enjoined by the 40th canon, and the oath of canonical obedience; and if it is a vicarage, the oath of personal residence; and he is to have certificates given him of his subscribing the declaration contained in the act of uniformity, in English, in a distinct instrument, under the hand and seal of the bishop; and of his other subscriptions and oaths, in Latin.

The clerk ought by all means to have witnesses of his institution, his taking the oaths, making subscriptions, &c. and therefore he should make some present to write their names on the back of his instruments, and make memorandums who they are, and where they live.

The church, by institution, is full against all persons but the king, but it is not full against the king, till induction; and the clerk by it may enter upon the parsonage house and glebe, and take the tithes; but he cannot let or grant them, nor sue for them, if they be refused to be paid till he be inducted.

After institution, the clerk is to receive a written mandate from the ordinary to the archdeacon, or other proper person, in order to his induction; without which he has not a full right to his temporalities, unless the benefice be a donative. See INDUCTION.

INSTITUTION, *African*, a society formed by the friends of the Abolition of the Slave-trade assembled on the 14th of April 1807, and established on the subsequent 15th of July. The resolutions adopted by the constituent meeting, as the basis of the association, are as follow: 1. That this meeting is deeply impressed with a sense of the enormous wrongs which the natives of Africa have suffered in their intercourse with Europe; and from a desire to repair those wrongs, as well as from general feelings of benevolence, is anxious to adopt such measures as are best calculated to promote their civilization and happiness. 2. That the approaching cessation of the slave-trade, hitherto carried on by Great Britain, America, and Denmark, will, in a considerable degree,

gree, remove the barrier which has so long obstructed the natural course of social improvement in Africa; and that the way will thereby be opened for introducing the comforts and arts of a more civilized state of society. 3. That the happiest effects may be reasonably anticipated from diffusing useful knowledge, and exciting industry among the inhabitants of Africa, and from obtaining and circulating throughout this country more ample and authentic information concerning the agricultural and commercial faculties of that vast continent; and that through the judicious prosecution of these benevolent endeavours, we may ultimately look forward to the establishment, in the room of that traffic, by which Africa has been so long degraded, of a legitimate and far more extended commerce, beneficial alike to the natives of Africa, and to the manufacturers of Great Britain and Ireland. 4. That the present period is eminently fitted for prosecuting these benevolent designs; since the suspension, during the war, of that large share of the Slave-trade, which has commonly been carried on by France, Spain, and Holland, will, when combined with the effect of the Abolition laws of Great Britain, America, and Denmark, produce nearly the entire cessation of that traffic along a line of coast extending between two and three thousand miles in length, and thereby afford a peculiarly favourable opportunity for giving a new direction to the industry and commerce of Africa. 5. That, for these purposes, a society be immediately formed, to be called the "African Institution." See the first report of the society, which proceeds to obviate the difficulties which may appear to lie in the way of the attainment of these interesting objects; and particularly to remove the most specious objection to the design, *viz.* despair of its success. The means by which this laudable association purposed to accomplish its noble and captivating objects are as follow: First of all, this institution, wise by the example of the Sierra Leone company, disclaims in the outset all projects of a colonial or commercial nature. It embarrasses itself with no concerns of government—no mercantile speculations—no factories or forts—not even with the possession of a single ship, or an acre of ground. This clears the way for exertion, not only by removing every suspicion of unworthy or doubtful motives, but by throwing off a thousand clogs which must have hampered an establishment of a different character. For obvious reasons the society also disclaims all schemes of religious mission; and avowing, upon that important subject, not certainly any kind of indifference, but a wise and necessary neutrality, it leaves in other hands the task of propagating the gospel among the Africans, and confines its own exertions to the introduction of that civilization, which is the best preparative for the truths of Christianity. Not to mention other reasons for this salutary caution, it has one most important and beneficial effect. It opens wide the doors of the institution to all sects and denominations of Christians,—whom it thus invites to co-operate for purposes equally subservient to every form of worship, and every modification of religious belief. The means which it is proposed by this society to employ for the purpose of promoting civilization and improvement in Africa, are of the following kind: "1. To collect and diffuse throughout this country accurate information respecting the natural productions of Africa, and, in general, respecting the agricultural and commercial capacities of the African continent, and the intellectual, moral, and political condition of its inhabitants. 2. To promote the instruction of the Africans in letters and in useful knowledge, and to cultivate a friendly connection with the natives of that continent. 3. To endeavour to enlighten the minds of the Africans with respect to their true interests; and to diffuse in-

formation amongst them respecting the means whereby they may improve the present opportunity of substituting a beneficial commerce in place of the slave-trade. 4. To introduce amongst them such of the improvements and useful arts of Europe, as are suited to their condition. 5. To promote the cultivation of the African soil, not only by exciting and directing the industry of the natives, but by furnishing, where it may appear advantageous to do so, useful seeds and plants, and implements of husbandry. 6. To introduce amongst the inhabitants beneficial medical discoveries. 7. To obtain a knowledge of the principal languages of Africa, and, as has already been found to be practicable, to reduce them to writing, with a view to facilitate the diffusion of information among the natives of that country. 8. To employ suitable agents, and to establish correspondences, as shall appear advisable; and to encourage and reward individual enterprise and exertion in promoting any of the purposes of the institution."—First Report. Besides, the society has adopted from the beginning, and since steadily pursued, the resolution of watching over the strict execution of the abolition laws—of procuring all information respecting the evasion or breach of those laws, which daring speculators may attempt—of keeping the attention of the government alive, and quickening the exertions of the crown-officers on those points—of suggesting, from time to time, such improvements in those laws as a practical experience of their imperfections, or the change of circumstances, may point out;—and, finally, of promoting, as far as possible, by communicating information, and other appropriate methods, the abolition of the African Slave-trade in foreign countries. This latter service is quite essential to the improvement of Africa; and it is such as a body, like the African institution, is well adapted to perform. The president of the African Institution is the duke of Gloucester; and of the directors, who chiefly carried on its ordinary business along with this distinguished prince, we shall only mention the names of Messrs. Wilberforce, Thornton, Vansittart, W. Smith, Brougham, Clarkson, G. Sharp, Allen, Stephen, and Macaulay, who, much to the advantage of the society, undertook the laborious and difficult office of secretary, until it could be filled by a permanent arrangement. A respectable subscription of about 3000*l.* was immediately raised. At the end of 1808, this had increased to 4374*l.*, of which 531*l.* arose from annual subscriptions. Since that time the funds have been augmented by many donations, and the list of annual contributors soon increased. For a further account of this institution, we refer to its annual reports, and to the *Edinburgh Review*, No. 30.

INSTITUTIONS, in *Literary Matters*, denote a system of the elements, or rules, of any art or science. Such are institutions of medicine, institutions of rhetoric, &c.

INSTITUTORES, in *Botany*, that set of authors in this science who have laid down certain settled rules, axioms, and institutions in it.

INSTRUCTIVE COLUMN. See COLUMN.

INSTRUMENT denotes a thing which is subservient to a cause for producing its effect.

A common case of mathematical instruments contains several compasses, a sector, scale, drawing-pen, and protractor. A case of surgeon's instruments for the pocket contains different sized lancets, scissors of several kinds, plain and toothed forceps, straight and crooked incision-knives, a spatula, probes, needles, &c. Astronomical instruments, are the telescope, quadrant, &c. Chemical instruments, see LABORATORY. For the method of dividing mathematical and astronomical instruments, see ENGINE and GRADUATION.

INSTRUMENTS of *Sacrifice*, in the *Antique Architecture*, are ornaments,

INSTRUMENT.

ornaments, as vases, pateræ, candlesticks, knives, &c. where-with the victims were killed, &c. instances of which we see in a Corinthian frieze in the remains of a temple behind the Capitol at Rome, &c.

INSTRUMENT is also used, in *Law*, to signify some public act, or authentic deed, by means whereof any truth is made apparent, or any right or title established, in a court of justice.

INSTRUMENT, primarily denoting writing, charter, or record, is sometimes used by Latin writers for the Old and New Testament. It occurs several times in Tertullian, reckoning the most ancient Latin writer of the church now remaining. He calls the Gospels, or the New Testament in general, the Evangelic Instrument, and says, "how large chasms Marcion has made in the epistle to the Romans, by leaving out what he pleases, may appear from one entire Instrument," or one unaltered copy of the New Testament, particularly of that epistle. Speaking of the shepherd of Hermas, he says, it was not reckoned a part of the Divine Instrument; thereby meaning, as it seems, the New Testament. He calls the law and the prophets the Jewish instruments, that is, writings or scriptures. He speaks of the antiquity of the Jewish instruments, or scriptures. He seems in one place (Apol. cap. 18.) to use the word instrument as equivalent to scriptures, containing the doctrine of revelation, or the revealed will of God. Lardner.

INSTRUMENT, in *Music*, is a general term, under which all artificial bodies, capable of producing and varying musical sounds in imitation of the voice, are comprehended. Every body capable of agitating the air by some shock, and exciting by its vibrations in this agitated state undulations sufficiently frequent, may produce sound; and all bodies capable of accelerating or retarding these undulations may vary their sounds. See *SOUNDS*.

There are three ways of producing sound by instruments: by the vibration of strings, by the vibration of elastic bodies, and by the collision of air inclosed in pipes. The invention of these instruments will be considered at the word *MUSIC*.

Instruments are generally classed under the three following heads; stringed-instruments, wind-instruments, and instruments of percussion. The stringed-instruments of the ancients were very numerous. Those most known were the following: the lyra, psalterium, trigonum, sambuca, citheira, pectis, magadis, barbiton, testudo, epigonium, simmicum, epandoron, &c. All these instruments were touched with the fingers or played with a plectrum.

Their principal wind-instruments were the tibia, fistula, tuba, cornu, lituus, hydraulicon, &c.

Their instruments of percussion were the tympanum, cymbalum, crepitaculum, tintinnabulum, crotalum, &c; but many of these are monotonous, and only render one sound.

Of most of these ancient instruments representations on plates have been given (Hist. Mus. vol. i.) from drawings made at Rome under our own eye, and under the guidance of Piranesi, and Messrs. Jenkins, Morrison and Byers, the best antiquaries at Rome in 1770; with a description and authorities for their local situation at the time.

The best books on the subject of ancient musical instruments, and the most worthy of being consulted, are Blanchini de Tribus Generibus Instrumentorum Veterum Organica; Gabinetto Armonica, del Bonanni; Bartolinus de Tibiis Veterum; and Essais sur la Musique par M. Laborde; who has given representations very neatly engraved of the musical instruments during the middle and lower ages, from illuminations in ancient MSS. of the Bibl. Royale at Paris in 1780; which, if the wish to render their delineation picturesque had not a little injured their fidelity, would be invaluable.

INSTRUMENTS, *Musical*, of the Abyssinians, from Mr. Bruce, the authenticity of whose account seems to be no longer doubted, we shall give from his letter inserted in Burney's General History of Music, vol. i.

"There are six musical instruments known in Abyssinia; the flute, the trumpet, the kettle-drum, the tambourine, the sistrum, and the lyre.

"The four first are used in war, and are by much the most common; the fifth is dedicated to the service of the church; and the sixth is peculiarly an attendant on festivity and rejoicings.

"There are two principal languages in Abyssinia, the Æthiopic, which is the literal, or dead language; and the Amharic, or language of Amhara, spoken by the court.

"The flute, in the Æthiopic, is called *Kwetzi*, a word difficult to be written or founded in English; in the Amharic, it is called Agädä; it is about the shape and size of the German flute, but played upon long-ways, with a mouth-piece resembling that of the clarinet; its tone is not loud, but accompanied with a kind of jar, like a broken hautbois; not owing to any accidental defect, but to construction and design, as it would not be esteemed without it.

"The kettle-drum is called in both languages *Nagareet*; because all proclamations are made by the sound of this drum (these are called Nägär), if made by governors, they have the force of laws in their provinces; but if made by the king, they are for all Abyssinia. The kettle-drum is a mark of sovereign power: whenever the king promotes a subject to be governor, or his lieutenant-general in a province, he gives him a kettle-drum, and standard as his investiture. The king has forty-five of these drums always beating before him when he marches. They are in shape and size like our's, only they are braced very disadvantageously; for the skin is strained over the outer rim, or lip of the drum, and brought a third down its outside, which deadens it exceedingly, and deprives it of that clear, metallic sound which our's has. Each man has but a single drum, upon the left side of his mule, and beats it with a crooked stick, about three feet long. Upon the whole, its sound is not disagreeable, and I have heard it at an incredible distance.

"The third instrument is the small drum, called Kābāro; in Æthiopic and Amharic; though in some parts of Amhara it is also called Hātāno. It is about half the diameter, and twice the length of our common drum; it is just the tambourine of Provence, only rounded to a point at the lower end. This is beaten always with the hand, and carried sometimes on foot, sometimes on horseback, when any inferior officer (not having a Nagareet) marches.

"The trumpet is called Mēlēkēta, or Mēlēket; and *Keret* in Amharic, but *Keren* in Æthiopic (or horn); which shews of what materials it was anciently formed. It is now made of a cane that has less than half an inch aperture, and about five feet four inches in length. To this long stalk is fixed at the end a round piece of the neck of a gourd, which has just the form of the round end of our trumpet, and is on the outside ornamented with small white shells; it is all covered over with parchment, and is a very neat instrument. This trumpet sounds only one note, E, in a loud, hoarse, and terrible tone. It is played slow when on a march, or before an enemy appears in sight; but afterwards it is repeated very quick, and with great violence; and has the effect upon the Abyssinian soldiers of transporting them absolutely to fury and madness, and of making them so regardless of life, as to throw themselves in the middle of the enemy, which they do with great gallantry. I have often in time of peace tried what effect this charge would

would have upon them, and found that none who heard it could continue seated, but that all rose up and continued the whole time in motion.

"The fifth instrument is the *sistrum*: it is used in the quick measure, or in allegros, in singing psalms of thanksgiving. Each priest has a *sistrum* which he shakes in a very threatening manner at his neighbour, dancing, leaping, and turning round with such an indecent violence, that he resembles rather a priest of paganism, whence this instrument was derived, than a Christian. I have forgot the name of the *sistrum* in Ethiopic, but on looking into my notes I shall find it.

"The sixth and last instrument is the lyre, which is never played solo, but always in accompanying the voice, with which it plays constantly in unison; nor did I ever hear *music in parts*, in any nation, savage or polished, out of Europe: this is the last refinement music received, after it was in possession of complete instruments, and it received it probably in Italy.

"The lyre has sometimes five, sometimes six, but most frequently seven strings, made of the thongs of raw sheep or goat skins, cut extremely fine, and twisted; they rot soon, are very subject to break in dry weather, and have scarce any sound in wet. From the idea, however, of this instrument being to accompany and sustain a voice, one would think that it was better mounted formerly.

"The Abyssinians have a tradition, that the *sistrum*, lyre, and tambourine were brought from Egypt into Æthiopia, by Thot, in the very first ages of the world. The flute, kettledrum, and trumpet, they say, were brought from Palestine with Menelek, the son of their queen of Saba, by Solomon, who was their first Jewish king.

"The lyre in Amharic is called *bēg* (the sheep); in Ethiopic, it is called *mēsinkō*; the verb *ſinko* signifies to strike strings with the fingers: no *plectrum* is ever used in Abyssinia, so that *mēsinko* being literally interpreted, will signify "the stringed instrument played upon with the fingers." This would seem as if anciently there was no other stringed instrument in Abyssinia, nor is there any other still." See THEBAN HARP, with Mr. Bruce's drawing and account of it, in the same volume.

Modern musical instruments will be described under their several heads as they occur.

In modern times, since harmony has sustained so important a part in music, musical instruments have been divided into *perfect* and *imperfect*, the first of these being such as are capable of executing or sounding as many notes of different pitches within a given compass, as within an octave for instance, as the harmony of the music performed upon it may require, without being forced to introduce notes, which make false or tempered intervals, or *wolves* with the other notes of the piece, sounded at the same time; as in the second class necessarily happens, in very numerous instances, where the notes are previously fixed and tuned, as it is called, to some certain scale or system of 12 notes within the octave, and which notes the performer of any one part in a piece of music has not the power of altering and adjusting to the true harmonic relation with the simultaneous notes of the bass, or other principal part: imperfect instruments are not, however, confined to those with 12 strings, pipes, &c. in an octave, but the term applies, though in a less degree, to instruments with 14, 16, or 17 strings, as shewn in our article HAWKE's temperament of the musical scale, where his 17 notes in the octave are proved to be incapable of banishing wolves, or false intervals, even from tempered systems, and which

Dr. Smith's harpsichords with 21 notes in the octave were alike unable to effect, in the numerous passages of modern music where double sharps or double flats occur: but on the improved organs and piano fortes of D. Loeschman, whose scale is extended to 24 notes, all such notes as usually occur can be truly given, according to any assigned system of temperament. The violin, viola, bass-viol or violoncello, and double bass, have held a distinguished rank in modern refined concerts as perfect instruments, and were, indeed, the only instruments that should be admitted to accompany the human voice, which exceeds, in the perfection of its scale, any instrument whatever, since a vocal performer, with a good ear and intonation, can instantly strike a perfect interval to any note whatever, without the least beating or degree of temperament or imperfection in the harmony, and this he does, by tempering the leaps or intervals of the melody (see MELODY, *Temperaments of*): it being absolutely and demonstrably impossible to avoid temperaments, or the use of imperfect intervals, either in the harmony or in the melody, (but they need not be used in both,) on perfect instruments, as on imperfect instruments they necessarily must, as is shewn in our article HARMONY, *Temperaments of*: the late Mr. Maxwell, in the year 1781, in his "Essay on Tune," sketched out the principles of an organ capable, by means of 44 pipes in each octave, of entirely banishing temperaments from the harmony, in 24 keys, 12 major and 12 minor: but we never heard until very lately, that any one had constructed such an instrument. It appears, however, that on the 3d of July 1810 the Rev. Henry Liston took out a patent for his *enharmonic organ*, and in the autumn of the year issued proposals for publishing, by subscription, "An Essay on perfect Intonation," and for exhibiting one of these patent organs in London, which had been completed in Scotland, and tuned, says his prospectus, "perfectly true throughout, *without any temperament whatever*, and performs every chord, in every key *absolutely perfect*, nor is there any combination which it is not capable of performing."—"The decided superiority of the harmony has been acknowledged by the best judges, and the performers have found no serious difficulty in the most sudden and extraneous modulation, or in the widest range of keys:" such were the pretensions of this instrument, and which no musical persons that we conversed or corresponded with seemed disposed to expect would be realized: however, in the beginning of this month (April 1811), Mr. Liston arrived in London with his organ, and had it put up at Flight and Robson's, organ builders in St. Martin's lane, and tuned it, and on the 16th politely gave us the opportunity to be the first that heard it performed on in London, and of hearing the effect of some glees sung to it; which proved delightful indeed, and rather exceeded our expectations than otherwise, though they had, as above hinted, been raised above those of most musical persons. The Rev. Mr. Liston also favoured us with the perusal of the manuscript of the first part of his intended work, in which we were delighted to observe, that a good knowledge and a correct application of mathematics is combined with a thorough knowledge of composition, and of the wants of the practical musician: the defect of one of which essential qualifications we have so often had to deplore, and even to reprobate, in our numerous quotations and references to modern writings on temperament, and on the nature and magnitude of musical intervals, in the different articles of our work. Mr. Liston's work will describe an instrument with 24 pipes in each octave, and to each of which two valves or shades, of different sizes, are adapted, affixed to radii from rolls or axles, that can be

turned by means of pedals, so that each of these pipes can be made to sound one major comma or two major commas flatter than the pitch of the pipe, making in all 72 sounds in each octave, which, by the 12 usual finger keys and the use of twelve pedals, enables the performer to give 33 perfect keys, without any tempered harmonies. The instrument, shewn as above, has not b F, but contains 20 pipes, and gives 60 different sounds within the octave. See the *Philosophical Magazine*, vol. xxxvii. p. 273, and our article *LISTON'S Scales of Musical Intervals*.

INSTRUMENT, *Wind*. See WIND.

INSTRUMENTAL ARITHMETIC. See ARITHMETIC.

INSTRUMENTAL Cause. See CAUSE.

INSTRUMENTUM SYNODALE. See SYNODALE.

INSUFFLATIO, a term used by some writers in medicine, to express the blowing into any part, in order to convey the fumes of medicine into it.

INSULATE, or INSULATED, a term applied to a column or other edifice, which stands alone, or free and detached from any contiguous wall, &c. like an island in the sea; whence the denomination is apparently derived.

INSULATED, in *Electricity*, is a term applied to bodies that are supported by electrics or non-conductors; so that their communication with the earth, by conducting substances, is interrupted.

INSULT, in *Law*. See ASSAULT.

INSULT, a military term used for the attack of any post with open force: without the apparatus of trenches, saps, or any regular approaches. See ASSAULT.

INSULTUS, a word used by the writers in medicine to signify the access of the paroxysm in intermittent diseases, or sometimes the first invasion of a disease.

INSUMA, in *Geography*, a town of Arabia, in the province of Hedsjas; 10 miles S.W. of Mecca.

INSUPER, a word used by the auditors of the Exchequer. In their accounts they say, so much remains *insuper* to such an account; that is, so much remains due on his account.

INSURANCE, or ASSURANCE, in *Law* and *Commerce*, a contract or agreement whereby one party, in consideration of a stipulated sum, undertakes to indemnify the other, against certain perils or risks to which he is exposed, or against the happening of some event. The party, who takes upon himself the risk, is called the "Insurer," sometimes the "Underwriter," from his subscribing his name at the foot of the policy; the party protected by the insurance is called the "insured;" the sum paid to the insurer, as the price of the risk, is called the "premium;" and the written instrument, in which the contract is set forth and reduced to form, is called a "policy of insurance, or assurance." See POLICY.

The risks against which insurances are made are infinitely various, and many frauds have been practised on the ignorant and credulous, under pretence of insurance, which the legislature has found it necessary, from time to time, to repress. In the reign of queen Anne, several offices were opened for making insurances on marriages, births, christenings, service, &c., and fraudulent practices prevailed to such a degree, that by stat. 9 Ann. c. 6. § 37, a penalty of 500*l.* is imposed on every person setting up such office, and 100*l.* on every person making such assurances in any office already set up. Fraudulent insurances have also occurred among dealers in lottery tickets, the shares and the chances of them,

which, besides the restraints to which they are subject in the annual lottery acts, have occasioned the stat. 27 Geo. III. c. 1, made expressly with a view to this evil, and by which they have been considerably diminished. See LOTTERY.

Insurances of the greatest public utility are, "Marine Insurances," including bottomry and respondentia, which are a species of marine insurance (see each of these articles);—"Insurance upon Lives" (see ASSURANCE); and "Insurances against Losses by Fire."

INSURANCES, *Marine*, are made for the protection of persons having an interest in ships, or goods on board, from the loss or damage that may happen to them from the perils of the sea, during a certain voyage, or a fixed period of time. By "peril" is here meant, not danger or hazard, according to the common acceptance of the term; but it signifies the "happening" of the event or misfortune of which danger was apprehended. The utility of this contract consists in the protection it affords to maritime commerce, by dividing losses, when they happen, between many, so as to make them fall less heavily on individuals, who are thus enabled to embark their whole capitals in hazardous enterprises. (See the preamble to the stat. 43 Eliz. c. 12.) As the Turks are unacquainted with insurance, they require for the loan of money 15 or 20 *per cent.*; and when they lend money to merchants who trade by sea, they charge 30 *per cent.* Some have ascribed the invention of insurance to the ancient Romans. Accordingly Puffendorf, Barbeyrac, Loccanius, Kulpis, and others, refer to a passage in Livy (l. xxiii. c. 44.), who says, that when the Roman army in Spain was distressed for provisions, cloathing, and other necessaries, a company engaged to convey to them every thing of which they stood in need, under this stipulation, that the state should make good their loss, in case their vessels should be shipwrecked by storms, or taken by the enemy. This was undoubtedly a promise of indemnification, but by no means an insurance, in which it is always necessary to give a premium. Kulpis, Anderfon, Malyne, and others, rely on the authority of Suetonius (l. v. c. 18.) who tells us, that the emperor Claudius promised to indemnify merchants for their losses, if their ships should perish by storms at sea; but neither this passage nor another that has been referred to in Valerius Maximus (l. vi. c. 5.), contains any thing that can be applied to insurance in the modern sense of the term. A passage has also been quoted by Grotius from Cicero's epistles (Epist. ad Fam. ii. ep. 7.), as a proof that the Romans were acquainted with this contract. But Cicero's words, justly interpreted, seem to bear a much stronger allusion to the practice of remitting money by means of bills of exchange, than to that of insuring against the perils of the sea. In the Pandects we have an observation of Ulpian, which affords greater reason for supposing that the contract of insurance was not altogether unknown to the Romans, than any of the passages already cited. He says (Dig. l. xlv. de verb. oblig.), "Illa stipulatio, decem millia salva fore promittis? valet." This passage, however, shews, as serjeant Marshall has observed, that the contract alluded to, whatever it might have been, was very little known at the time when Ulpian wrote, since he thought it necessary to remark, that "it was not illegal." Malyne, Anderfon, &c. affirm, that insurance is mentioned in the marine laws of the isle of Oleron, on the coast of France, which was much celebrated in the 11th, 12th, and following centuries, on account of its trade. But in these laws there is no trace of insurance, as the learned editor, Cleirac, acknowledges. The celebrated maritime laws of the city of Wisby, in the island of Gothland, are equally silent with regard to insurance. Insurance was, undoubtedly,

not known in 1597, when the ordinances of the Hanseatic league were framed, nor in 1614, when several new regulations were added; because, though the contract of bottomry is mentioned in these regulations, there is not a word on the subject of insurance, nor does any thing certain occur in the collection of maritime laws, intitled "*Il Consolato del Mare*," written in the Catalonian dialect, partly framed in the 11th, but for the most part in the 13th century, and published at Leyden in 1704. (See *Marine Law*.) Some have said, without sufficient authority, that the practice of insurance was introduced by the Jews in 1182; and others have sought its origin about the year 1560, in the great woollen commerce that subsisted between England and the Netherlands. But as the maritime commerce of the Italian states appears to have been carried on to a very considerable extent about the end of the 13th century, it is very probable that insurance came into use in Italy about that time. From thence it was transplanted into all the countries where the Lombards had established their trading companies. One of these companies settled in London, and from them Lombard-street in that capital took its name. According to Malynes insurance was introduced into England by the Lombards somewhat earlier than into the neighbouring countries on the continent; and in proof of this, he says, that even Antwerp, in its meridian glory, borrowed insurance from England; and that, down to the time in which he wrote (1622), there was, in every policy made at Antwerp, and other places in the Low Countries, a clause inserted, that it should be in all things the same as policies made in Lombard-street, in the city of London; the place where the Lombards are known to have first settled, and carried on their commerce in England, and where the merchants of London used to hold their meetings before the Royal Exchange was built. Anderson (*Hist. of Commerce*) says, that the vast commerce carried on about the middle of the 16th century, between England and the Netherlands, introduced the practice of insuring from losses by sea, by a joint contribution. But the preamble to the statute 43 Eliz. c. 12, already cited, which statute was passed in 1601, distinctly states, that it had been an "immemorial usage" among merchants, both English and foreign, when they made any great adventure, to procure insurance to be made on their ships or goods adventured. From this it may be reasonably supposed, that insurance must have been in use in England long before the middle of the preceding century. The law of insurance, says Mr. Marshall (*ubi infra*), is considered as a branch of marine law; and it is also a branch of the law of merchants (see *LAW*); and it may be collected from these two sources in the ordinances of different commercial states, in the treatises of learned authors on the subject of insurance, and in judicial decisions of this country, and also of others professing to follow the general marine law and the law of merchants. The earliest ordinance now extant on the subject of insurances is that of Barcelona, supposed to have been published about the year 1435. The next ordinance on this subject was published at Florence in the beginning of the year 1523. The emperor Charles V. in 1551 published several regulations concerning maritime commerce, called the "*Caroline*" code, to which his son Philip II. added a number of new ordinances in 1563 and 1565. Magens, in his "*Treatise on Insurance, Average, and Bottomry*," published at Hamburgh in 1753, has collected many of these ordinances; but the most complete system of positive law for the regulation of insurances, that has yet appeared in any country, may be found in the celebrated ordinance of the marine of Louis XIV., published in 1681.

The statutes pertaining to this subject, which have been enacted in England, have not been numerous; and, therefore, the practice among us has been found most conformable to the general usage of trade. As to treatises on insurance, the earliest now extant is that entitled "*Le Guidon de la Mer*," which is found in the collection of marine institutions, published at Rouen in 1671 by Cleirac, under the title of "*Les Us et Coutumes de la Mer*." This is supposed to have been written about the 15th century. In France, Valin, Pothier, and Emerigon, have written on this subject. The treatise of the latter is, in the judgment of serjeant Marshall, the most useful to an English lawyer of all the foreign publications on this subject. Roccus, Cafaregis, Locennius, Bynkerhoek, and Santerna, have also published treatises on this subject. We have also in England detached observations on insurance in the treatises of Malynes, Molloy, Beawes, Postlethwaite, and some others of less note. Mr. Magens, a merchant, in 1735, republished in two volumes 4to. his "*Essay on Insurance*," which he had before published in German at Hamburgh. Mr. Millar, a learned advocate at the Scots bar, published at Edinburgh, in 1787, the "*Elements of the Law relating to Insurances*;" Mr. Park has also given to the world his excellent "*System of the Law of Insurances*;" and in 1802 the public was favoured by Samuel Marshall, serjeant at law, with his "*Treatise on the Law of Assurance*," in 4 books, containing an ample account of every thing that is essentially necessary to be known on this subject. As to judicial decisions, none of these are considered as binding authorities in our superior courts, except such as have been there determined; and even these may be re-considered and over-ruled. Before the passing of the act of queen Elizabeth, above cited, almost all disputes, arising upon contracts of insurance, were settled by arbitration, and without recurring to any legal proceedings. And there seems to have been a particular tribunal for such arbitrations, established in London, composed of persons annually appointed by the lord mayor. From Malynes we learn that there was an "office of assurances," on the west side of the Royal Exchange, where insurances were made; and to this office belonged certain commissioners, who were annually appointed. The authority of these commissioners was confirmed by act of parliament, in the latter period of the reign of queen Elizabeth. (See *Court of Policies of Assurance*.) This court gradually sunk into disrepute, and all suits on policies of insurance were preferred in the courts of common law. After some of the decisions of the courts of Westminster, on questions of insurance, came to be generally known, the confidence which the justice, impartiality, and ability of those courts inspired through Europe, soon induced the merchants of all countries to prefer English insurances to those of any other country.

The parties to the contract of insurance are the insured and the insurers. In this country, all persons, whether British subjects or aliens, may, in general, be insured. The principal, if not the only exception to this rule, is the case of an alien enemy. The insurance of the ships and merchandize of France, during a war with that country, is prohibited by 21 Geo. II. c. 4; and by 33 Geo. III. c. 27. § 4, which latter statute not only declares such insurances to be void, but also subjects the parties concerned in them to three months' imprisonment. The policy of this prohibition was however disputed in 1741, by sir John Barnard, and in 1748 by sir Dudley Rider and Mr. Murray, then attorney and solicitor-general. But their objections were over-ruled. Nevertheless, it appears that a neutral, though residing in the enemy's country, and carrying on

trade there, and even in partnership with an alien enemy, may insure his interest in the joint property.

Those who are insurers, or underwriters, should be persons of great prudence and circumspection; and cases may occur, which will require more than ordinary sagacity, penetration, and experience. At common law, any man, or company of men, might be insurers; and individuals, upon their own separate account, have still the same right. But about the beginning of the last century it was thought expedient, partly with a view of counteracting the evil arising from insurance by insufficient persons, and perhaps, principally for enabling government to raise a sum of money by the sale of a monopoly, to erect two companies for making marine insurances, with such funds to answer all demands on their policies as might give confidence to mercantile adventurers, who were unwilling to depend on individual underwriters; still, however, leaving to merchants the option of insuring with such underwriters whom they thought proper. To this end the stat. 6 Geo. I. c. 18, authorized the king to grant charters to two distinct companies or corporations, for the insurance of ships, goods, and merchandize, at sea, or going to sea, and for lending money on bottomry. In pursuance of the powers given by this act, the two proposed companies, the one called the "Royal Exchange Assurance," and the other the "London Assurance," were established by royal charter, bearing date June 22, 1720. The most important privilege granted to these companies was the exclusive right of making marine insurances, and lending money on bottomry, as a "Company" or "Partnership," on a "joint capital."

Insurance is said to be "a contract of indemnity from loss or damage, arising upon an uncertain event." So that the object of insurance is to avoid a possible loss. Hence it appears, that there cannot be an indemnity without a loss, nor a loss without an interest. A policy, therefore, without interest, is not an insurance, but a mere wager. It is not easy to define and ascertain insurable interest. The interests of commerce, and the various rights which different persons may have in the same thing, require that not only those who have an "absolute" property in ships and goods, but those, also, who have a "qualified" property in them, may be at liberty to insure them; and this principle has been so extended, that if a merchant abroad, in order to secure the payment of a debt due to his correspondent in England, mortgage to him his interest in certain goods and freight; the correspondent, after the mortgage becomes absolute, may insure the "legal" interest on his own account, or the "equitable" interest on account of the mortgagor. A reasonable expectation of "profit," or a well-founded expectation of a future interest in the thing insured, is an insurable interest. But a mere hope or expectation of future gain, however well founded, is not an insurable interest, unless accompanied by possession of the subject-matter of the insurance. Of this nature is the interest which the captor acquires in a prize regularly taken in war. It also appears, that persons in the character of "trustees," for the disposal of ships and goods according to such instructions as they might receive from third persons, may insure such ships and goods for the benefit of the persons who may eventually be entitled to the produce of them. Accordingly, commissioners, entitled "The Honourable Commissioners for the Sale of Dutch Property," were appointed by 35 Geo. III. c. 80. § 21. to take into their care all Dutch ships, &c. detained in British ports, and to dispose of them in pursuance of directions from the privy council; and they were authorized to insure, in their own names, such ships, after seizure at sea, and while they were on their

passage to England. At common law, an insurance might have been made without interest; nor is it necessary to aver interest in any case not prohibited by 19 Geo. II. c. 37. An insurable interest can only be founded on a legal or equitable title; but a mere claim, which the law cannot admit to be either legal or equitable, is not an insurable interest. As freight can only be due to the legal owner of a ship, he only can insure it; and no person can have either a legal or equitable title to a ship, unless he be named in the register. Although "respondentia" and "bottomry" are of themselves a species of insurance, yet the lender has an insurable interest in his securities, and therefore may protect himself from the sea-risk by insuring them. However, a policy on bottomry or respondentia cannot be subscribed by the borrower of the money; for if he were to become an insurer, this would be no longer a loan upon bottomry, but a cloak for usury. See *Wager-POLICY*, and the sequel of this article.

Insurances are of various kinds, as on ships or parts of ships, on merchandize singly, and on ships and goods jointly, on freight, and bottomry loans; and these are again branched out to run either for a time stipulated, or to one single port, or out and home, with liberty to touch at the different places mentioned in the policy.

It is laid down as a general rule, that no insurance can be legally made upon any voyage undertaken contrary to the laws of this kingdom, or to those of its dependencies, or to the law of nations. Nor is it of any importance whether the insurer was or was not informed that the voyage was illegal. Consequently, an insurance upon a voyage undertaken contrary to the navigation laws would be void. The case is the same with regard to a voyage prohibited by the laws made for the protection of the monopoly of the East India company. Under the treaty allowing the Americans to trade to the British colonies in India, concluded in 1795 and confirmed by 37 Geo. III. c. 97, it is not necessary that this trade should be carried on from America to the British settlements in the East Indies "direct;" but it may be carried on "circuitously" by the way of Europe. With respect to the risks or perils against which insurances are usually made, they are expressed in the words of the policy, which are as follow: "Touching the adventures and perils which we the assurers are contented to bear, and do take upon us in this voyage, they are of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and counter-mart, surprisals, takings at sea, arrests, restraints and detentions of all kings, princes, and people, of what nation, condition, or quality whatsoever: barratry of the master and mariners; and of all other perils, losses, and misfortunes, that have or shall come to the hurt, detriment, or damage of the said goods and merchandize, and ship, &c., or any part thereof, without prejudice to this insurance." But by the agreement of the parties, the general words of the policy may be altered or qualified, and any of the risks may be wholly or in part excluded: and the insurance may be made only against some particular risks, or up to, or beyond certain degrees, or upon particular articles. In the policies of most countries it is stipulated that the insurer shall not be liable for any partial loss under a given rate *per cent.* A clause to this purpose, which was first introduced in 1749, is inserted at the bottom of all English policies. Nevertheless, the insurer is liable for losses, however small, called "general average," and losses occasioned by the "stranding of the ship." In the policies of private underwriters the memorandum is as follows: "corn, (comprehending every sort of grain, and also pease and beans,) fish, salt (not including salt-petre), fruit, flour and feed, are warranted free from

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average, unless general (denoting losses arising from any cause affecting the general safety of the ship and cargo), or the ship be stranded: sugar, tobacco, hemp, flax, hides and skins are warranted free from average, under 5 *per cent.*, and all other goods, also the ship and freight, are warranted free from average, under 3 *per cent.* unless general, or the ship be stranded." In 1754 the two companies, *viz.* those of the *London* and *Royal Exchange* assurance left out the words, "or the ship be stranded;" but private underwriters have continued them. If any loss or damage happen to the goods, from any fault or defect of the ship, the owner has his remedy against the proprietors of the ship, and the insurer is not liable; because, in every contract of insurance, there is an implied warranty, that the ship is sea-worthy: if otherwise, the contract is void. In many cases the master also is liable. The marine law, with which agrees the common law of England, considers the owners, as well as the master, as common carriers, and answerable for all losses, except such as arise from the act of God, the king's enemies, or the perils of the sea. In order to charge the insurer, the loss must happen in the course of the voyage, and during the continuance of the risk. In our policies the words usually employed to express the commencement and end of the risks on goods are these: "Beginning the adventure upon the said goods and merchandize *from the loading thereof aboard the said ship*, and so shall continue and endure until the said ship with the said goods shall be arrived at ——— (her port of delivery), and until the same be discharged and safely landed." This rule, however, admits of some exceptions, which our limits will not allow us to enumerate. The duration of the risk on the ship varies with us in almost every case. In outward-bound voyages it is generally made to commence from her beginning to load at her port of departure. Ships engaged in the coasting-trade, or in short voyages, are insured for a limited period of time; and in such cases, the risk commences and ends with the term, wherever the ship may then happen to be. If a ship be insured *from* the port of London to any other port, and before she breaks ground, an accident happen to her, the insurers are not answerable; for the risk does not commence till she sets sail on her departure from the port of London: but if the insurance be "*at and from*" the port of London, the insurers are liable for any accident that may happen to her, "*from the time of subscribing the policy.*" When a ship, in homeward voyages, expected to arrive at a certain place abroad, is insured "*at and from*" that place, or from her arrival there, the risk begins from the first moment of *her arrival at the place* specified; and the words "*first arrival*" are implied, and always understood in policies so worded. As to the termination of the risk on English policies, it is usually made to continue only "*until the ship hath moored at anchor 24 hours in good safety.*" The risk on the furniture, the rigging and tackle, and provisions of the ship, may continue even when put on shore. With insurers, a liberty to touch and stay at any ports and places, means ports and places in the usual course of the voyage. This liberty to touch and stay at any ports or places, does not authorize the insured to break bulk and trade. Although a ship, through necessity, change the order of the places at which she is to touch, yet if she do not abandon the original voyage, the risk continues. In an insurance upon freight, the risk generally begins from the time the goods are put on board. If an accident happen to the ship before any goods are put on board, which prevents her from sailing, the insured cannot recover for the loss of freight, which the ship might have earned if the accident had not happened. But if part of the cargo be put on

board, and the rest be ready to be shipped, the insured may recover for the whole freight, upon a valued policy. (See *POLICY.*) If a ship be lost in her way to her port of loading, the insurer is liable for the whole freight.

If, after the insurance is effected, any thing be done by the insured to alter the nature of the risk, this must be done with the consent of the insurer, otherwise it will avoid the contract.

Insurances may likewise be made on goods sent by land, or by hoys, &c. on rivers; and this is frequently done, more especially on jewels, and other things of great value. They may likewise be made on ships and goods, lost or not lost, which is commonly done when a ship has been long missing; and those words being inserted in the policy, oblige the underwriters to pay, though the ship was lost at the time of making such insurance, except the assured had then certain knowledge of the ship's being wrecked; in which case the subscription shall not oblige, as this is accounted a mere fraud. So likewise if a person get more insured than the ship is worth, with a villainous design to destroy her, this fraudulent act will not oblige the insurers, but expose the proprietors to suffer death for their knavery. An insurance made on prohibited goods is illegal and void, unless they were not prohibited till after the insurance was made. The insurance of seamen's wages is prohibited in all maritime countries; and by the law of England such insurance is unquestionably illegal. But they may insure goods purchased abroad with their wages; and the captain is allowed to insure goods which he has on board, or his share in the ship, if he be a part-owner. By the law of France, the insurance of freight, not actually earned, is prohibited; but in England the freight, as well as the ship, may be legally insured. To entitle the owner, however, to recover for a loss on a policy for freight, it must appear, that, before the loss, the owner's right to freight had commenced; that is, that the ship had actually begun to earn freight, for till that time the risk on freight does not commence. Although it is not unusual in England to insure profit, the question whether this be a proper subject of insurance has never yet come under solemn discussion. Where the policy expressly mentions that the ship is to depart with convoy, it is intended that she shall, if possible, keep with the convoy during the voyage, and if she depart wilfully from the convoy, it is a fraud; but if having departed with the convoy, she by stress of weather loses the convoy, and is taken, the insurers are liable. (See *WARRANTY.*) If there be thieves on board among themselves, the master of the ship is to answer for that, and not the insurers; for though the words of the policy insure against losses by thieves, yet assailing or external thieves are only here intended, and for external theft the insurer as well as the owner of the ship is liable; but the proprietor of the goods, or the insurers in his name, may recover against the owners. An insurance made in a foreign country, may be sued in England by the common law, if the insurers come here. Where the policy is against restraint of princes, that does not extend to a navigation carried on against the law of nations, or where there shall be a seizure for not paying of customs or the like. If goods be insured as the goods of an ally, when they are the goods of an enemy, it is a fraud, and the insurance not good. If a man pays money on a policy of insurance, supposing a loss where there was none, this shall be money received for the use of the insurer, for which he may maintain an action. A suppression of the truth, or a false allegation, is sufficient to discharge the policy; for it is a general rule, that the insured ought to inform

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inform the insurer of all material circumstances that were come to his knowledge at the time of making the policy, in order that the contract may be fairly adjusted; which being a contract upon chance, cannot be done, if one party knows more than the other; for equality in contracts, by the law-merchant, is essential; but a proof of an intention to make a deviation, will not avoid the policy before the deviation is actually made. See REPRESENTATION.

By an act made in 19 Geo. II. c. 37. it is determined, that after the first day of August, 1746, no insurance shall be made on ships or lading, "interest or no interest," or "without further proof of interest than the policy," or by way of gaming or wagering, or without benefit of salvage to the insurer, and that every such insurance shall be void: that it shall not be lawful to make re-insurance, unless the insurer shall become insolvent, become a bankrupt, or die: in which cases such insurer, or his executors, &c. may make re-insurance to the amount of the sum before insured, provided it be expressed in the policy to be a re-insurance (see REINSURANCE): that all sums of money lent on bottomry or respondentia, upon any ships belonging to his majesty's subjects, bound to or from the East Indies, shall be lent only on the ship or merchandize, laden, or to be laden, on board such ship, and shall be so expressed in the condition of the bond; and the benefit of salvage shall be allowed to the lender, his agent or assigns, who alone shall have a right to make insurance on the money so lent; and no borrower of money on bottomry, &c. shall recover more on any insurance, than the value of his interest in the ship or merchandize, exclusively of the money so borrowed; and in case it shall appear, that the value of his share in the ship and merchandize does not amount to the full sum borrowed, such borrower shall be responsible to the lender for so much of the money borrowed, as he hath not laid out on the ship or merchandize, with lawful interest for the same, together with the insurance and all other charges, to the proportion which the money not laid out shall bear to the whole money lent, notwithstanding the ship and merchandize be totally lost. And, in all actions brought by the insured, the plaintiff, or his attorney or agent, shall, within 15 days after he shall be required so to do, in writing, by the defendant, or his attorney or agent, declare in writing what sum or sums he hath insured or caused to be insured in the whole, and what sums he hath borrowed, at respondentia or bottomry, for the voyage, or any part of the voyage in question.

Whenever advice is received of the loss of a ship or goods insured, application is to be made to the insurers, and the vouchers produced; and if they are satisfied, they will pay the money: but if they have cause to scruple the doing it, the insured must stay till the insurer can obtain a more satisfactory account; but if nothing be heard of the ship in any reasonable time, the insurers will be obliged to pay the money agreed upon.

In adjusting a loss, the quantity of damage for which the underwriters are responsible is first to be ascertained; and the next point to be settled is by what rule this shall be appraised. The adjustment is usually indorsed on the policy and signed by the underwriters. When the loss is admitted to be *total*, and the policy is a valued one, the insured is entitled to receive the whole sum insured, subject to such deductions as may have been agreed by the policy to be made in case of loss. It is merely in respect of total loss that any difference subsists between an open and a valued policy. Upon the latter the value is admitted, and the insured has only to prove, if the insurance was on goods, that

the goods valued were on board. Upon an open policy, it is necessary to prove, not only that the goods were on board, but also the value of them, which the insurers, provided it does not exceed the sum insured, are bound to pay. But in the case of a *partial* loss, the amount of the loss should be ascertained in both kinds of policy. When a part of the goods insured is saved, and this exceeds the amount of the freight, the practice is to deduct the freight from the salvage, and to estimate the loss by the difference; but when the freight exceeds the salvage, then it is a total loss. If the goods insured are damaged in the whole, or in part, it will be necessary to ascertain the *quantity* of such damage, which is done by taking the value of the goods, in their damaged state, from the prime cost, and the remainder will be the amount of the loss. If several articles be insured for one entire sum, but with a distinct valuation to each, and only one be sent in risk, and if that one be lost, the insured shall recover such a proportion of the sum insured as the value of that article bore to the value of the whole. If the policy has a clause, to be free of average from a particular risk, under so much *per cent.* and a loss occasioned by that risk takes place, the proportion which the loss bears to the cargo must be calculated upon the cargo which was on board when the loss happened, not upon that which was on board at any other time. With respect to the valuation of goods insured, there has been a difference of opinion; some contending for the prime cost, others for the current price at the time of loss; some again insisting on the price at the time and place of shipping the goods, others on the price at the port of discharge. In England, if the policy be an open one, it is an invariable rule to estimate a total loss, not by any supposed price which the goods might have been deemed worth at the time of the loss, or for which they might have been sold, if they had reached the market for which they were destined; but according to the prime cost, that is, the invoice price, and all duties and expences till they are put on board, together with the premium of insurance. The value is never affected by the rise or fall of the market, nor by the course of exchange. A ship is valued at the sum she is worth at the time when she sails on the voyage insured, including the expence of repairs, the value of her furniture, provisions and stores, the money advanced to the sailors, and, in general, every expence of the out-fit, to which is added the premium of insurance. A partial loss upon either ship or goods is that proportion of the prime cost, which is equal to the diminution in value occasioned by the damage. An adjustment, being indorsed on the policy and signed by the underwriters, with a promise to pay in a given time, is *prima facie* evidence against them, and amounts to an admission of all the facts necessary to be proved by the insured to entitle him to recover in an action on the policy. It is like a note of hand, and being proved, the insured has no occasion for further proof. An adjustment, however, may be impeached by shewing that the underwriter was induced to sign it by some fraud or concealment, or by some misconception of the law or fact; but this must be done by evidence, and not by doubts or surmises after the time for payment is come.

If it be inquired, under what circumstances the insured shall be entitled to demand a return of premium, the particular cases are as follow. In general, the premium ought to be returned, when the contract is void *ab initio*; that is, either for want of interest in the insured, or because the insurance is illegal, or on account of fraud on the one side or the other. However, upon a wager-policy the insured can-

not

not recover back the premium, at least after the risk is run. 19 Geo. II. c. 37. But before the risk is run, and while the contract is executory, the insured may recover back the premium. If the contract be void, as being a re-insurance, within the above cited statute, the insured shall not be intitled to a return of premium. If, under any circumstances, the insurer might, at any time, have been called upon to pay the whole sum insured, the premium is earned, and he shall not be obliged to return any part of it. Although an insurance to protect trading with the enemy is void, yet the insured shall not recover back the premium. In the case of fraud likewise on the part of the insurers, the premium shall be returned. However it has been doubted, whether the insurer be bound to return the premium, in a case where fraud has been committed by the insured. The court of chancery, in two instances, ordered a return of premium where the policies were declared void for fraud committed by the insured. The courts now hold a contrary doctrine. As to the commencement of the risk, the rule in England is, that where the risk has not been begun, whether this be owing to the fault, pleasure, or will of the insured, or to any other cause, the premium shall be returned. But if the insurances be upon a voyage, divisible into several distinct risks, or, which amounts to the same, into several distinct voyages, the premium may be apportioned, according to these several risks; and if one or more of these risks should not have been commenced, the proportion of premium applicable to those parts shall be returned. But if the risk be entire and be once commenced, there shall be no return. If part of the premium is to be returned upon the performance of some stipulation agreed upon between the parties, this shall be returned, though the insurer be obliged to pay a partial loss. As the insurer can never, by his own act, discharge himself from the contract, it seems reasonable, that, where the insured thinks proper to put a stop to the adventure, and prevent the risk from ever commencing, he should make some compensation to the insurer for his trouble and disappointment; it is therefore the general custom in all the maritime countries of Europe, to allow him to retain one-half *per cent.*

With regard to actions on policies of insurance, the sole jurisdiction belongs to the courts of common law; and the proper form of action against private underwriters, is special "Assumpsit;" which see. The two insurance companies, being corporations, can do no act but by deed under their common seals. Their policies of insurance, being under seal, no action of "Assumpsit" will lie upon them, but only debt of covenant. See stat. 6 Geo. I. c. 18, and 8 Geo. I. c. 30. The evidence generally adduced on the part of the plaintiff is reducible to the following heads, *viz.* proof of the contract, payment of the premium, interest of the insured, performance of warranties and loss. For a further detail of these and other particulars, relating to matters of insurance, and the determinations of judges and courts of law in illustration and confirmation of them, see "A Treatise on the Law of Insurance," by Samuel Marshall, serjeant at Law, in 2 vols. Lond. 1802. On this subject; see farther under *BARRATRY, Insurance Brokers, Deviation, Policy, Salvage, Underwriters, and Warranty.* See also *BOTTOMRY and RESPONDENTIA.*

Insurance upon Lives, is a contract by which the insurer, in consideration of a certain premium, either in a gross sum or by annual payments, undertakes to pay the person, for whose benefit the insurance is made, a stipulated sum of money, or an equivalent annuity, upon the death of the person whose life is insured, whenever this shall happen,

if the insurance be for the whole life, or in case this shall happen within a certain period, if the insurance be for a limited time. For the principles on which this kind of insurance is made, and other particulars relating to it, see the article *ASSURANCE.* It is generally a condition or warranty, in insurances upon lives, either inserted in the policy, or contained in a declaration or agreement signed by the insured, that the person whose life is meant to be insured has not any disorder which tends to the shortening of life; that he has, or has not, had the small-pox; and that his age does not exceed so many years; that this declaration shall be the basis of the contract between the insurers and the insured; and that if any untrue averment be contained therein, the contract shall be void, and all money paid on account of the insurance forfeited. As this declaration is to be taken as part of the written contract, amounting to a warranty, it behoves every person who makes an insurance upon a life, to be very circumspect in ascertaining the truth of the allegations which it contains; because upon that the validity of the contract must depend. When there is no warranty, the insurer takes the risk upon himself, whatever may be the state of health of the person whose life is insured, unless there be some fraudulent misrepresentation or concealment.

In order to check the spirit of gaming, which is ready to avail itself of insurance upon lives, it is enacted by stat. 14 Geo. III. c. 48. § 1, that no insurance shall be made by any person or persons, bodies politic or corporate, on the life or lives of any person or persons, or on any other event or events whatever, wherein the person or persons, for whose use or benefit, or on whose account, such policy or policies shall be made, shall have no interest, or by way of gaming or wagering; and that every insurance made contrary to the true intent and meaning of this act, shall be null and void to all intents and purposes whatsoever; and that it shall not be lawful to make any policy or policies on the life or lives of any person or persons, or other event or events; without inserting in such policy or policies the name or names of the person or persons interested therein, or for what use or benefit, or on whose account, such policy is so made or underwrote;—and that in all cases where the insured hath an interest in such life or lives, event or events, no greater sum shall be recovered, or received from the insurer or insurers, than the amount or value of the interest of the insured in such life or lives, or other event or events. This act extends to every species of insurance except marine insurances, which are expressly excepted. The different insurance companies annex to the contract certain conditions or exceptions. For those of the "Royal Exchange Assurance" (see *ASSURANCE*.) The same exceptions are adopted by the "Westminster Society." The "Equitable Assurance," and the "Pelican Life-insurance," adopt the same exceptions, only omitting the word "duelling," even where the party insures his own life. Other societies for insurance on lives, such as the "Rock Insurance Society," &c. have been more recently established, and insurances of this kind are made by some of those societies, which will be noticed in the next article.

The societies which restrict themselves to insurance on lives are the following; *viz.* the "Amicable Society," incorporated by royal charter of queen Anne in 1706, sanctioned by the grant of two subsequent charters in 1730 and in 1790, and further improved under the powers conferred by a new charter in 1807. By virtue of this charter, persons are admitted to insure their own lives, or the lives of others, in which they may have an interest, on the following payments:—

Table

INSURANCE.

Table for the whole of life, for each share, amounting to 180*l.* with such addition as the circumstances of the year may produce, to be paid on the death of the insured.

Age.	Premium on Admission.	Annual Contribution.	Age.	Premium on Admission.	Annual Contribution.
	£. s. d.	£. s. d.		£. s. d.	£. s. d.
8 to 14	1 11 0	3 8 6	41	2 6 0	6 11 0
15	1 11 6	3 10 6	42	2 6 6	6 15 0
16	1 12 0	3 12 6	43	2 7 0	6 19 0
17	1 12 6	3 15 0	44	2 8 0	7 3 0
18	1 13 0	3 17 0	45	2 9 0	7 7 0
19	1 14 0	3 19 0	46	2 9 6	7 11 6
20	1 14 6	4 0 6	47	2 10 6	7 16 0
21	1 15 0	4 2 0	48	2 11 0	8 1 6
22	1 15 6	4 4 0	49	2 12 0	8 7 0
23	1 16 0	4 5 6	50	2 13 0	8 12 0
24	1 16 6	4 7 0	51	2 14 0	8 18 0
25	1 17 0	4 9 0	52	2 14 6	9 4 0
26	1 17 6	4 11 0	53	2 15 6	9 10 0
27	1 18 0	4 13 0	54	2 16 0	9 17 0
28	1 18 6	4 15 0	55	2 16 6	10 4 0
29	1 19 0	4 17 0	56	2 17 6	10 11 0
30	1 19 6	4 19 0	57	2 18 6	10 19 0
31	2 0 0	5 1 6	58	2 19 6	11 7 6
32	2 0 6	5 4 0	59	3 0 6	11 16 6
33	2 1 0	5 6 0	60	3 1 6	12 6 0
34	2 1 6	5 9 0	61	3 2 6	12 16 0
35	2 2 6	5 11 6	62	3 3 6	13 7 0
36	2 3 0	5 14 6	63	3 4 6	13 19 0
37	2 3 6	5 17 6	64	3 5 6	14 11 6
38	2 4 0	6 1 0	65	3 6 6	15 6 0
39	2 4 6	6 4 0	66	3 7 6	16 1 0
40	2 5 0	6 7 6	67	3 8 6	16 17 6

The whole of the annual contributions for every share granted previous to the last charter, and seven eighths of the contributions on shares subsequently granted, are to be divided every year amongst the claimants by deaths which happen in that year: a principle of division, which is calculated, in the general course of things, to raise each claim considerably above 180*l.* which sum at least the corporation engages each share shall produce to the claimant. See ASSURANCE.

The "Society for Equitable Assurances on Lives and Survivorships" was established by deed, inrolled in his majesty's court of king's bench, Westminster. For an account of this society, which has acquired high reputation, under the conduct of its present actuary, William Morgan, esq. see ASSURANCE. The "Westminster Life Insurance Office" was established in 1792. The "Pelican Office" for insurance of lives, granting annuities and endowment of children, was established in the year 1797. The "Rock Life Assurance Company" was instituted in 1806, on a principle different from that of any society hitherto established for the assurance of a sum to the representatives of a person assured. The company consists of a number of proprietors, possessing a capital stock of one million; and each proprietor is under the necessity of assuring a sum on his own life, if accepted

by the directors; or on that of an approved nominee, to the amount of one quarter of the stock in his name. Thus by assuring each other's lives, the proprietors have a mutual interest in the support of the society, and are engaged to each other to take care that no improper life, with their knowledge, be admitted into it. By the mode of assuring property in this society, the representatives of the assured receive a certain sum at his decease, and whatever addition may have been assigned to that sum by the previous resolution of the society, agreeably to its deed of settlement. The persons who assure in this office are not all partners; they are not all responsible for the payment of the sum assured to each individual. The assured are either proprietors or non-proprietors. The proprietors are answerable each to a certain amount; they lay down a certain sum, and form a determinate capital to answer all contingencies, and by thus forming a capital, they are enabled to make a due assignment of the sum to be added at different periods to various policies of assurance. The assured non-proprietors have no share in the risk: they pay down definite premiums, which assure to the representatives the sum assured, and who partake equally with proprietors in the addition which may be made at different periods to each policy. The security for the payment of that sum is the capital stock of the company and the amount of all the premiums, with the interest upon them. Such a security, it is said, may be deemed as a "rock," whence we apprehend the company derives its appellation; for the transfer of shares will produce a continual renovation of policies, which, with the capital of the company, and the amount of annual payments from assurances, will form an increasing fund, adequate to every purpose of profit and security. The character of William Friend, esq. the actuary of this society, as a mathematician, is well known. The "Provident Life Institution" was established in 1806. In the same year was also established the "Philanthropic Annuity Institution;" the object of which is to enable those, who wish to raise an immediate sum of money by the grant of annuities, or to invest money for the purpose of accumulation, to do it on the most advantageous terms suited to the various circumstances and contingencies of life; and also to provide endowments for children, &c. The investment of money in this institution may be made in three different ways: 1st, by paying a certain sum of money down, to receive an annuity, to commence immediately: 2dly, by paying down a certain sum of money, to receive an annuity, to commence at a future time: and, 3dly, by paying a sum of money at particular periods, to receive back a sum, or an annuity when the investor requires it. The "London Life Association" for the assurance of lives, consists of persons insuring their respective lives for the whole term of life; and the members become, to the amount of their policies, mutual assurers to one other. The society also undertakes every description of assurance on the lives of persons, not members; and it is part of its plan to make endowments, and to grant and purchase annuities, by virtue of an act of parliament of the 47th Geo. III. c. 32. The distinguishing principle of this society is, that the benefits resulting from its transactions shall be enjoyed by the members, during life, so as to render life assurance as easy to the assured, as a due regard to security will admit. The "Royal Exchange Assurance Annuity Company" has been already mentioned under the article ASSURANCE: but in May 1803, the following table of rates was formed:

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A Table of Rates of the Royal-Exchange Assurance Annuity Company.

Single Lives.

Age.	Years Purchase.	per Cent. per Ann.	Age.	Years Purchase.	per Cent. per Ann.	Age.	Years Purchase.	per Cent. per Ann.
		£. s.			£. s.			£. s.
3	16,39	6 2	30	15,87	6 6	57	11,63	8 12
4	16,66	6 0	31	15,87	6 6	58	11,36	8 16
5	16,95	5 18	32	15,62	6 8	59	11,11	9 0
6	16,95	5 18	33	15,62	6 8	60	10,87	9 4
7	17,24	5 16	34	15,38	6 10	61	10,63	9 8
8	17,24	5 16	35	15,38	6 10	62	10,41	9 12
9	17,24	5 16	36	15,15	6 12	63	10,20	9 16
10	17,24	5 16	37	15,15	6 12	64	10,00	10 0
11	17,24	5 16	38	14,92	6 14	65	9,80	10 4
12	17,24	5 16	39	14,92	6 14	66	9,61	10 8
13	17,24	5 16	40	14,70	6 16	67	9,43	10 12
14	16,95	5 18	41	14,49	6 18	68	9,25	10 16
15	16,95	5 18	42	14,28	7 0	69	9,00	11 2
16	16,95	5 18	43	14,08	7 2	70	8,77	11 8
17	16,95	5 18	44	13,88	7 4	71	8,54	11 14
18	16,66	6 0	45	13,70	7 6	72	8,33	12 0
19	16,66	6 0	46	13,51	7 8	73	8,13	12 6
20	16,66	6 0	47	13,33	7 10	74	7,93	12 12
21	16,66	6 0	48	13,15	7 12	75	7,75	12 18
22	16,39	6 2	49	12,98	7 14	76	7,57	13 4
23	16,39	6 2	50	12,82	7 16	77	7,40	13 10
24	16,39	6 2	51	12,65	7 18	78	7,24	13 16
25	16,39	6 2	52	12,50	8 0	79	7,09	14 2
26	16,12	6 4	53	12,34	8 2	80	6,94	14 8
27	16,12	6 4	54	12,19	8 4	upwards 6,94 14 8		
28	16,12	6 4	55	12,05	8 6			
29	15,87	6 6	56	11,90	8 8			

Joint Lives and the Survivor.

Ages.	Years Purchase.	per Cent. per Ann.	Ages.	Years Purchase.	per Cent. per Ann.
		£. s.			£. s.
45 & 45	15,87	6 6	40 & 45	16,66	6 0
46 46	15,62	6 8	50	16,39	6 2
47 47	15,38	6 10	55	16,12	6 4
48 48	15,15	6 12	60	15,87	6 6
49 49	14,92	6 14	65	15,62	6 8
50 50	14,70	6 16	70	15,38	6 10
51 51	14,49	6 18	75	15,15	6 12
52 52	14,28	7 0	80	14,92	6 14
53 53	14,08	7 2	45 & 50	15,38	6 10
54 54	13,88	7 4	55	15,15	6 12
55 55	13,70	7 6	60	14,92	6 14
56 56	13,51	7 8	65	14,70	6 16
57 57	13,33	7 10	70	14,49	6 18
58 58	13,15	7 12	75	14,28	7 0
59 59	12,98	7 14	80	14,08	7 2
60 60	12,18	7 16	50 & 55	14,28	7 0
61 61	12,65	7 18	60	14,08	7 2
62 62	12,50	8 0	65	13,88	7 4
63 63	12,34	8 2	70	13,70	7 6
64 64	12,19	8 4	75	13,51	7 8
65 65	12,05	8 6	80	13,33	7 10
66 66	11,90	8 8	55 & 60	13,33	7 10
67 67	11,76	8 10	65	13,15	7 12
68 68	11,63	8 12	70	12,98	7 14
69 69	11,36	8 16	75	12,82	7 16
70 70	11,11	9 0	80	12,65	7 18
71 71	10,87	9 4	60 & 65	12,50	8 0
72 72	10,63	9 8	70	12,34	8 2
73 73	10,41	9 12	75	12,19	8 4
74 74	10,20	9 16	80	11,90	8 8
75 75	10,00	10 0	65 & 70	11,63	8 12
76 76	9,80	10 4	75	11,36	8 16
77 77	9,52	10 10	80	11,11	9 0
78 78	9,25	10 16	70 & 75	10,63	9 8
79 79	9,00	11 2	80	10,10	9 18
80 80	8,69	11 10	75 & 80	9,61	10 8
85 85	8,00	12 10	80 & 85	8,47	11 16

N. B. The foregoing annuities are receivable in quarterly Payments.

INSURANCES against Fire, are founded on a contract, by which the insurer, in consideration of a certain premium, received by him, either in a gross sum, or by annual payments, undertakes to indemnify the insured against all loss or damage which he may sustain in his houses or other buildings, goods, and merchandize, by fire, during a limited period of time. Although the precise time of the introduction of this kind of insurance into England cannot be ascertained, it has certainly been in use here considerably more than a century. Of late years, notwithstanding a very heavy, and we may add impolitic, stamp-duty imposed on these insurances, they have very generally, not to say universally, prevailed in this country: particularly in London, and other cities and large towns. In other countries they have been less general, and more recently introduced. The

fire-office at Paris is said to have been established in 1745. In Holland, though insurance against fire is not altogether unknown, yet few people seek its protection; because they rely on their own caution, and do not chuse to incur the expence of any greater security. It has, indeed, been confidently asserted, by persons well acquainted with the cities both of London and Amsterdam, that after making all fair allowances, there is, upon an average, more property destroyed by fire in the former in one year than in the latter in seven years. Some persons have charged many of the fires that occur in London and its vicinity on insurance: but though negligence and fraud may in some instances derive encouragement from this establishment, the benefits must be allowed far to overbalance the mischiefs of which it is, directly or indirectly, productive. In London and other

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parts of the kingdom, companies or societies for insurances against fire have been very numerous; and their number has possibly been augmented by the emoluments that accrue to those who establish and conduct them. Some of these are called "Contribution Societies," in which every person insured becomes a member or proprietor, participating in profit and loss. Such are the "Hand in Hand," and the "Westminster" fire-offices, for the insurance of houses and other buildings; and the "Union" fire-office, for insurance of goods. The other companies insure both houses and goods at their own risk. Of these the principal are the "London" and "Royal-Exchange" Assurance Corporations, the "Sun," the "Phoenix," and the "British" fire-offices.

As to the duties to which this contract is liable, the stat. 37 Geo. III. c. 90. § 23. repeals all the former stamp-duties imposed on policies of insurance against fire; and (by § 24.) imposes on every policy, in lieu thereof, a new duty of *three shillings*, where the sum insured is under 1000*l.*, and of *six shillings* where the sum insured amounts to 1000*l.* or upwards. And by the stat. 44 Geo. III. a duty of *two shillings and sixpence per cent. per annum* is to be levied on property insured against fire. It is much to be regretted, that insurances against fire are often made to a large amount upon property of very small value; this can only be done with a fraudulent view, and a premeditated fire must be the necessary consequence. Such practices require caution in the insurers, ought to be restrained, and when they occur severely punished. If there be several insurances on the same property in different offices, each office should have notice, that the same may be allowed by indorsement on the policy; in order that each office may bear its rateable proportion of any loss that may happen. But unless such notice be given to the office where another insurance is made on the same effects, the insurance made without such notice will be void. In general, the risk commences from the signing of the policy, unless some other time be specified; and it will of course end with the term for which it is made. Insurances against fire are, in general, either annual or for a term of seven years, at an annual premium; and the offices, as an indulgence to the insured, generally allow fifteen days from the expiration of each year for the payment of the premium for the next succeeding year. But the insured has always been considered as being under the protection of the policy till the expiration of the fifteen days, provided the premium were paid within that time. Several offices now hold themselves liable for any loss during the fifteen days that are allowed for the payment of the renewed premium upon annual policies, and others for a longer period; but every policy for a shorter period than a year ceases at six o'clock in the evening of the day that is mentioned in it. A policy of insurance, being a chose in action, is, in strictness, not assignable at law; but it may be assigned in equity. However, the mere assignment of the policy would be of little avail without an assignment of the subject-matter of the insurance also. In the printed proposals of all the offices, it is declared, that, upon the death of an insured, his interest in the policy shall be continued to his representative to whom the property insured belongs, provided that such representative, before any new payment be made, procure his right to be indorsed on the policy at the office. The policies of the Contribution Societies, viz. the "Hand in Hand," "Union," and "Westminster," may be assigned, without any express permission from the respective offices for that purpose; and it is sufficient if the assignment be brought to the respective offices to be entered. But the other offices give notice,

generally upon the policy, that it shall be of no force if assigned, unless such assignment be allowed by an entry in the books of the office, or indorsed on the policy: and hence it seems to be a settled rule in all the offices, not to allow any transfer of any policy without the consent of the managers. If an assignor of the property insured undertake to get the policy transferred to the assignee, he will be liable to an action for neglecting to do it; even though his undertaking was merely gratuitous. For the proof and recovering of loss, the following article is found in the proposals of several of the offices, importing, "that persons insured sustaining any loss or damage by fire, are forthwith to give notice thereof at the office, and, as soon as possible afterwards, deliver in as particular an account of their loss and damage as the nature of the case will admit of; and make proof of the same by their oath or affirmation, according to the form practised in the said office; and by their books of accounts, or other proper vouchers, as shall be reasonably required; and procure a certificate under the hands of the minister and churchwardens, together with some other reputable inhabitants of the parish not concerned in such loss, importing, that they are well acquainted with the character and circumstances of the person or persons insured, and do know, or verily believe, that he, she, or they, really and by misfortune, without any fraud or evil practice, have sustained by such fire the loss and damage, as his, her, or their loss, to the value therein mentioned. But till such affidavit or certificate of such insured's loss shall be made and produced, the loss-money shall not be payable. And if there appears any fraud or false swearing, such sufferers shall be excluded all benefit by their policies." In the policies of these offices the insurers undertake to pay the loss, not exceeding the sum insured, "according to the exact tenor of their printed proposals," describing their proposals by their respective dates.

Insurances against fire are described in the plans and proposals of the different societies, with little variation, as *common*, *hazardous*, and *doubly hazardous*; and they comprehend buildings and goods. *Buildings* subject to *common* insurances are those of brick or stone, standing alone, or separated by partition walls, and covered with slate, tile, copper, lead, or iron, with brick chimneys; in which no hazardous trades are carried on, or hazardous goods deposited. *Goods* are household goods, in private dwellings, merelandize and stock, not hazardous, in brick or stone buildings as above described, and in which no hazardous trades are carried on, nor hazardous goods deposited. *Hazardous* insurances comprehend *buildings* of timber or plaster, brick and timber, or brick and stone, not having party walls of brick or stone, wherein no hazardous trades are carried on, or hazardous goods deposited, brick or stone buildings in which hazardous trades are carried on, or hazardous goods deposited; also thatched barns and out-houses (having no chimnies, or adjoining to any building having a chimney), containing farmer's stock or implements of husbandry; likewise all shops and warehouses which have German or metal stoves with pipes. *Goods* subject to the same kind of insurance are the stock and goods of bread-bakers, brewers, vinegar and sweet-makers, printers, hot-pressers and calenderers, carpenters, chemists, coach-makers, colour-men, coopers, hemp and flax-dressers, innholders, malthouses, oil leather-dressers, ship and tallow-chandlers, stable-keepers, pawn-brokers, hemp, flax, pitch, tar, turpentine, rosin, tallow, hay, straw, and all manner of fodder, and corn unthraffed, apothecaries' stock; also, oil and spirituous liquors, as merchandize and the stock in timber-yards. *Doubly hazardous* insurances comprehend *buildings* which

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which are thatched, also timber or plaster buildings, in which hazardous goods are deposited, or hazardous trades carried on; and goods or stock in thatched dwellings; also salt-petre, working-perfumers, tallow-melters, wax-chandlers, spermaceti candle-makers, and rope-makers in brick and tiled buildings, boat-builders, china, glass, or earthen wares.

The "Hand in Hand Fire-office" was instituted in the year 1696; and its terms are, for *common* insurances, 3000*l.* or under, 2*s.* per cent. per annum: for *hazardous* insurances, 3000*l.* or under, 3*s.* per cent. per annum: for *doubly hazardous* insurances, 3000*l.* or under, 5*s.* per cent. per annum. If insurances are desired for any larger sums than are specified in the table of premiums, a special agreement may be made for the same, and also for particular buildings, goods, &c. not included in the second and third articles above

enumerated. Persons insuring in this office are allowed one year's premium and duty, and must pay the requisite premiums and deposit according to the nature of the risk. They become joint proprietors and members of the society, and are entitled to a proportionate share of the profits.

The "Union Fire-office" was instituted in 1714, for insuring houses and buildings, goods, merchandize, and ships in harbour, in dock, or while building, from loss or damage by fire. The septennial insurances are allowed one year's premium and duty, and become proprietors, partaking of the profits of the society. The annual or short period insurances are completely protected from any loss or damage by fire, or from any call or contribution towards any loss or damage happening to others, by a very ample fund which has been raised for that purpose.

TABLE OF ANNUAL PREMIUMS.

(*Exclusive of Government Duty.*)

	Common.			Hazardous.			Doubly Hazardous.		
£.	£.	s.	d.	£.	s.	d.	£.	s.	d.
On sums not exceeding 3000	0	2	0	0	3	0	0	5	0
6000	0	2	6	0	4	0	0	6	0
	} per cent.			} per cent.			} per cent.		
Larger Sums may be insured by special Agreement.									

No charge is made for policies of 300*l.* and upwards. Farming stock may be insured at 2*s.* per cent.. The "Royal Exchange Assurance," of which we have given an account, as far as it is a life-insurance office, under ASSURANCE, insures also from loss or damage by fire.

TABLE OF ANNUAL PREMIUMS.

(*Not including Duty.*)

Common Assurances.	Hazardous Assurances.	Doubly Hazardous Assurances.
Not exceeding } 2 <i>s.</i> per cent. 3000 <i>l.</i>	Not exceeding } 3 <i>s.</i> per cent. 2000 <i>l.</i>	Not exceeding } 5 <i>s.</i> per cent. 2000 <i>l.</i>
Larger Sums may be assured by special Agreement; and Farming Stock at 2 <i>s.</i> per cent.		

The corporation of the "London Assurance" insures houses and goods from fire, and also insures lives. (See ASSURANCE.) The premiums are as follows:

Common Assurances.	Hazardous Assurances.	Doubly Hazardous.
Sums not exceeding } 2 <i>s.</i> per cent. 10,000 <i>l.</i>	Sums not exceeding 3000 <i>l.</i> 3 <i>s.</i> 0 <i>d.</i> per cent. Above 3000 <i>l.</i> and not exceeding 5000 <i>l.</i> 3 <i>s.</i> 6 <i>d.</i> Above 5000 <i>l.</i> 4 <i>s.</i> 0 <i>d.</i> 5 <i>s.</i> per cent. Farming Stock, 2 <i>s.</i> with average clause.
— above 10,000 <i>l.</i> 2 <i>s.</i> 6 <i>d.</i>		

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Persons assuring for seven years, will be allowed one year's premium, and duty ; for six years, 10 *per cent.* on the premium ; for five years, 8 *per cent.* ; for four years, 6 *per cent.* ; for three years, 4 *per cent.* ; for two years, 2 *per cent.*

Premiums of assurance from fire for ships in harbour, building, or repairing, or for cargoes, or for vessels and other craft employed in inland navigation, and goods, &c. laden thereon.

	For one Year.	For six Months.	For three Months.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Sums not exceeding £. 10,000	3 0	2 6	2 0 <i>per cent.</i>
Above 10,000	4 0	3 0	2 6

Five *per cent.* discount allowed on premium. The premium on goods, hazardous or not hazardous, in any of the warehouses or sheds, or on the open wharfs, or in any part of the port of London, within five miles of the Royal Exchange (the West India docks excepted), with the average clause, 5*s. per cent.* ; on goods not hazardous, similarly situated, 3*s. per cent.* The average clause, so often referred to, is as follows : It is agreed, that if the goods assured shall be of greater value than the sum assured, and the same shall not be

totally consumed, the insurer shall only be liable to pay such a proportion of the loss as the sum assured shall bear to the whole value of the goods at the time of the breaking out of any fire. On sums of 300*l.* and upward, the policy and mark are allowed gratis.

The "Sun Fire-office" was established in the year 1710, and insures against loss or damage by fire, upon the following terms.

Table of Rates.

Annual Premiums to be paid for Insurances.				
Sums not exceeding	10,000	Common	2 <i>s. per Cent.</i>	} Sums above may be insured by Special Agreement.
	6,000	Hazardous	3 <i>s. Ditto.</i>	
	3,000	Doubly Hazardous . .	5 <i>s. Ditto.</i>	
Farming Stock, on any Part of the Farm, insured under General Policies, without the Average-Clause, at 2 <i>s. per Cent.</i>				
N. B. Any barn, or other out-building, and the farming stock therein, may be insured under one sum :—premium 3 <i>s.</i>				

Persons may insure for more years than one, not exceeding seven ; and, in such case, there will be an abatement of six-pence in the pound per annum, on the premiums agreed for, for every year except the first : In a common insurance of 1000*l.* for seven years, the premium to be paid, by the table, will be seven pounds, in which the six-pence in the pound per annum is to be deducted for the last six years, that is, three shillings and six-pence per annum, which amounts to one pound one shilling, and reduces the sum to be paid to five pounds nineteen shillings, and the same in proportion for any other sum or number of years ; and persons insuring can never be subject to any calls or contributions to make good losses.

The "Sun Life Assurance Society" grants annuities, makes assurances on lives and survivors, and provides for the endowment of children ; on the terms, and in the manner of other offices for insuring lives.

"The Westminster Fire-office" was established in the year 1717. The terms are, in the first class of common insurances, for any sum not exceeding 10,000*l.*, 2*s. per cent. per annum* ; in the second class of hazardous insurances, for any sum not exceeding 6000*l.*, 3*s. per cent. per annum* ; in the third class of doubly hazardous insurances, for any sum not exceeding 3000*l.*, 5*s. per cent. per annum.* The fourth class includes insurances by special agreement. Every septennial insurer becomes a member of the society, and shall be allowed one year's premium ; he will also have a propor-

tionable share of the profits, and be liable to contribute to losses, but not to exceed 10*s. per cent.* on the first ; 15*s.* on the second ; and 20*s.* on the third class of insurances.

The "Phoenix Fire-office" was established in 1782 ; and its premiums are for common insurances, for sums not exceeding 3000*l.*, 2*s. per cent. per annum* ; for hazardous insurances, for similar sums, 3*s. per cent. per annum* ; and for double hazardous insurances, the sums being the same, 5*s. per cent. per annum.* Hay and corn in barns or stacks, and other farming stock, may be insured at 2*s. per cent. per annum.* Ships, barges, and all kinds of water-craft ; also, cargo on board may be insured at 3*s. per cent. per annum*, for sums not exceeding 3000*l.* Insurances on larger sums, and on goods, &c. peculiarly hazardous, may be effected by special agreement. Persons chusing to insure for seven years, will be charged for six years only ; and for any number of years, more or less than seven, will be allowed a reasonable discount both on the premium and the insurance tax.

"The Globe Insurance" was established in 1803, and comprehends the granting insurances against loss or damage by fire, on lives and survivorships, the endowment of children, and immediate, deferred, and progressive annuities. This office makes common insurances at an annual premium of 2*s. per cent.* ; hazardous insurances at 3*s. per cent.* ; and doubly hazardous insurances at the annual premium of 5*s. per cent.* Farming stock is insured at 2*s. per cent.* ; and this may be insured for three, six, or nine calendar months at certain stipulated rates.

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rates. Policies are allowed in all cases where the annual premium amounts to 6*s*. Insurances for seven years are charged only six years premiums; and a considerable reduction is made on country insurance. The insurances on lives and on survivorship are made at the rates of other offices; nor does the company require entrance money, or admission fees, from persons effecting life insurances. The capital of the company is stated to be one million sterling, the whole of which has been invested in government or real securities, and it is stipulated that no members of the company shall be liable to pay any sum beyond the amount of his subscription or share in the said capital of one million.

The "Imperial Fire-office" was established in 1803. Its capital, of one million two hundred thousand pounds sterling, has been subscribed in shares of 500*l*. each; and no member is a subscriber for more than 5000*l*. Each member has deposited 10*l*. per cent. on the amount of his subscription, amounting in the whole to 120,000*l*. which sum is invested, and to accumulate for five years, without dividends to the members of the company. In case the current premiums on insurances, with the deposit of 120,000*l*. and all its accumulations, shall prove inadequate to satisfy the losses which may arise, the members of the company are, from time to time, to be called upon for farther sums, in proportion to their subscriptions, and even to their full extent, if necessary. If the current premiums shall be more than sufficient to answer losses, and the expenses of management, the surplus is, from time to time, to be invested; but such profits are in no event to be divided, but are to be applied for augmentation of the capital stock; and the dividends and interest of the profits only are to be divided, after the expiration of five years. The premium in common insurances is 2*s*. per cent. per annum for 3000*l*. and under; in hazardous insurances, 3*s*. per cent. per annum, for 1000*l*. or under; and in double hazardous insurances, 5*s*. per cent. per annum, for 1000*l*. or under. Persons chusing to insure for seven years will be charged for six years only; and for any number of years, less than seven, will be allowed a reasonable discount, both on the premium and duty.

The "Albion Fire and Life Insurance Company" was instituted in the year 1805; and is stated to possess a capital of one million sterling. Its insurance against loss or damage by fire is in the first class of common insurances 2*s*. per cent. per annum, to the amount of 3000*l*.; in the second class of hazardous insurances, 3*s*. per cent. annually; and in the third class of doubly hazardous insurances, 5*s*. per cent. per annum both to the same amount. Insurances are taken to a larger amount than that above stated; and policies are granted at suitable premiums for less than 12 months. On insurances for seven years, or for any greater or less term, exceeding one year, a considerable allowance is made, both on the premium and duty. The following abatements are made on the premiums of fire insurances of the first class, out of London; viz. 25 per cent. per annum on policies for single years; 30 per cent. on policies for three years; 35 per cent. on policies for five years; 40 per cent. on policies for seven years; and in the like proportion for policies for other periods. Insurances on lives are conducted on the same terms with those of other offices of a similar kind. No admission fine is charged on life insurance.

The "British Fire Office" insures houses and goods in the three classes above specified at 2*s*., 3*s*., and 5*s*. per cent. per annum respectively.

The "Hope Fire and Life Insurance Company" was instituted in 1807. Its annual rates of insurance on the three classes above recited are, 2*s*. per cent., 3*s*. per cent., and 5*s*. per cent. on sums not exceeding 10,000*l*., 6000*l*., and 3000*l*.,

respectively. Farming stock is insured at 2*s*. per cent. on a sum not exceeding 10,000*l*. Special risks may be insured on terms corresponding to them. The following abatements are made upon country assurances, viz. 10 per cent. on policies for a single year; 15 for three years; 20 for five years; 25 for seven years. Every person not being a proprietor of a share or shares in the company, and who shall insure or procure to be insured, property to the amount of 1000*l*., shall, upon the payment of 5*l*. beyond the premium of insurance, be entitled, out of the profits (arising from fire insurance only) to such interest or dividend as may arise and become payable on one 50*l*. share in the capital stock of the company; and so on in like manner for every additional 1000*l*. so insured; and such interest or dividend shall continue to be paid to such person or persons, or to his or their legal representative or representatives, during such period as such insurances shall continue to be effected, and in the event of the same being discontinued, all dividends and interest, which may be then due or payable, together with the sum of 5*l*. so paid for every 1000*l*. so insured as aforesaid, shall be forfeited and become the property of the company. Life insurances are effected by this company on the same terms with those of other offices. Persons not being proprietors, who insure, or procure to be insured, 500*l*. upon their own lives, or lives of others, will, upon the payment of ten shillings per cent. (on the admission of the party) beyond the premium paid for the insurance, be entitled, out of the profits of the life fund, to such interest or dividend as may be paid on a 50*l*. share to the several proprietors thereof, and so on in like manner for every 500*l*. so insured; but in no case whatever are they to be responsible for any claims which the life fund may be called upon to pay, the capital of the company being of a sufficient magnitude for that purpose.

The "Eagle Insurance Company" was instituted in 1807, for fire and life insurance, and for granting annuities. Its capital is stated at two millions sterling. The annual rates of insurance against fire are as follows:

Annual Rates of Insurance.

	s.	d.	
Common Insurance, not exceeding 10,000 <i>l</i> .	2	0	per cent.
Above	2	6	
Hazardous ditto, not exceeding 6000 <i>l</i> .	3	0	
Ditto, above	4	0	
Doubly hazardous, not exceeding 3000 <i>l</i> .	5	0	
Ditto, above 3000 <i>l</i> . and not exceeding 4000 <i>l</i> .	6	0	
Ditto, above 4000 <i>l</i> . and not exceeding 5000 <i>l</i> .	7	6	

Farming Stock.

	s.	d.	
Without average clause, for three months	1	3	per cent.
for six months	1	6	
for any longer period, not exceeding 12 months	2	0	

The building and stock of sugar refiners, sugar grinders, sea biscuit bakers, distillers, musical instrument makers, cotton-spinners, calico printers, flax dressers, and other extraordinary risks, may be insured by special agreement.

Policies for short periods, or less than a year, may be effected at considerably reduced premiums, and will pay only a proportionable part of the duty. The insurance on lives is conducted as in other offices.

The "County Fire Office" was established in 1807, for the express benefit of country residents. The distinguishing principles

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principles of this institution are, that its business consists of a selection of the best risks; that the persons insured become members; that all the members share the profits equally, according to the sums which they respectively contribute during seven years (whether their policies be taken out originally for seven years, or be renewed annually), and with the important advantage of not being liable to make good the losses of others, as a surplus capital of 400,000*l.* has been provided to meet any excess of losses that may occur. In common insurances of 5000*l.* and under, in one risk, the annual premium is 2*s.* *per cent.*; in hazardous insurances, of 3000*l.* and under, in one risk, 3*s.* *per cent.*, above 3000*l.* and under 5000*l.*, 4*s.* *per cent.*; in doubly hazardous insurances, 3000*l.* and under, in one risk, 5*s.* *per cent.*, above 3000*l.* and under 5000*l.*, 7*s.* *per cent.* Larger insurances, according to the above description of risks, may be made by special agreement: and other insurances against more hazardous risks may be settled in the same manner. Hay, corn, and other agricultural stock, of whatever description, on any part of a farm, may be insured in one general sum, at the

reduced rate of 2*s.* *per cent.* without the average clause. Persons insuring for seven years will be charged only for six; and for any number of years more or less than seven, discount will be allowed both on the premium and duty. All the offices insure against fire by lightning. It will be remembered, that a duty of 2*s.* 6*d.* *per cent.* *per annum*, on all property insured from fire, is payable to government, under an act of the 44th of George III.

The "Atlas Assurance Company" was established in 1808, and undertakes to assure the proprietors of buildings, merchandize, furniture, farming stock, goods and effects, and also of craft and shipping upon canals and in harbour, against loss by fire; and also grant assurance upon lives. The capital is stated at one million two hundred thousand pounds, of which the sum of 120,000*l.*, invested in government or real securities, will be applicable to the immediate purposes of the institution; and the remainder guaranteed under a deed of settlement by a numerous and respectable proprietary.

Rates of Assurance per Annum.

Risks.	Quality.	Per Cent.	On Sums not exceeding—
		<i>s.</i> <i>d.</i>	<i>£.</i>
First . . .	Not Hazardous	2 0	} 5000 } Unless by Special Agreement.
Second . . .	Hazardous	3 0	
Third . . .	Doubly Hazardous	5 0	
Fourth . . .	Farming Stock	2 0	
Fifth . . .	Risks, to which none of the above rates will apply.—These may be assured by Special Agreement, on Terms as moderate as the nature of them will permit.		
N. B. An additional premium of Sixpence <i>per cent.</i> will be required on buildings or goods within the Water-Side District, for extra risk.			

No charge is made for policies or indorsements on them: and for the encouragement of persons making assurance for seven years by one payment, a deduction of one-seventh part of the premium and duty will be made; and if at the end

of that period a further assurance of seven years be effected on the same property, a deduction of one-fifth part of the premium, and so on for succeeding years. The terms of life-assurances are much the same as those of other offices.

A Table, exhibiting the Amount of the Duty on Insurances for the Year 1810.

Total Amount 381,162 <i>l.</i> 1 <i>s.</i> 5 <i>d.</i>											Property Insured 304,929,65 <i>0l.</i>				
	Lady Day.			Midsummer.		Michaelmas.		Christmas.		Total.					
	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.			
Sun	27247	8	0	23144	9	10	20590	6	8	22885	12	4	93867	16	10
Phoenix	16241	5	2	12980	16	5	13875	5	2	14611	8	1	57709	4	10
Royal Exchange	10952	6	7	10012	15	0	11087	14	2	13014	17	1	45067	12	10
Imperial	9718	1	9	7638	9	9	8995	0	0	8995	3	0	35346	14	6
Globe	7980	16	5	5761	6	9	6678	18	9	6932	18	7	27353	10	6
British	4377	4	8	4198	17	2	4195	17	6	3923	6	1	16695	5	5
Hope	4327	15	2	3802	4	7	3266	12	6	4482	5	5	15878	17	8
Albion	4532	2	5	3804	13	4	3583	1	6	3763	11	8	15683	8	11
County	3645	2	11	2773	15	3	2718	2	3	4527	14	11	13664	15	4
Westminster	3113	9	4	3143	8	2	2857	18	7	2939	17	9	12054	13	10
Hand in Hand	3161	15	5	2853	19	10	2698	12	3	2791	5	3	11505	12	9
Eagle	3133	8	6	2606	4	10	2919	17	9	2696	1	4	11355	12	8
Atlas	2120	15	11	2285	12	0	2606	5	7	2802	16	0	9815	9	6
London	1879	10	7	1608	11	6	3150	8	11	2674	6	1	9312	17	4
Union	1803	11	10	1395	15	2	1418	16	11	1229	14	9	5847	18	8

INTACTÆ, right lines to which curves do continually approach, and yet can never meet with them; more usually called *asymptotes*.

INTAGLIOS, precious stones, having the heads of great men, inscriptions, and the like, engraven on them; such as we frequently see set in rings, seals, &c.

IN-TAKER, a name anciently given to certain banditti, or free-booters, who inhabited part of the North of England, and made frequent incursions into the very middle of Scotland; plundering the inhabitants wherever they came.

Those who made the expeditions, were called *out-parters*; and those who were left behind to receive the booty, *intakers*. 9 Hen. V. c. 7.

INTAVOLARE, *Ital.* to write music for the lute and guitar in tablature, instead of musical characters. See **TAB-LATURE** and **TIME-TABLE**.

INTAWA, in *Geography*, a town of Hindoostan, in Bundelcund; 15 miles E. of Pannah.

INTEGERS, in *Arithmetic*, denote whole numbers; in contradistinction to fractions.

Integers may be defined to be, numbers which refer to unity, as a whole to a part.

INTEGRAL, or **INTEGRANT**, is applied by the schoolmen to those parts which are necessary to the integrity of a whole. In which sense they stand contradistinguished from *essential* parts.

Thus the arms, legs, &c. are integral parts; body and soul, essential parts of a man.

INTEGRAL Calculus, in the *New Analysis*, is the counter part to the differential calculus.

This last has been completely explained by the marquis De l'Hospital; but the other still remains imperfect, having been yet but little cultivated.

The integral calculus of Leibnitz, and other foreigners, answers to what the English call *inverse method of fluxions*. See **FLUXIONS**, and **CALCULUS**.

INTEGRANT PARTS, in *Philosophy*, the similar parts of a body, or parts of the same nature with the whole; as filings of iron are the integrant parts of iron, and have the same nature and properties with the bar they were filed off from. The chemists distinguish, in their resolutions of bodies, between the dividing and resolving them into integrant parts like these, and what they call constituent parts; that is, dissimilar parts, or the principles of the bodies they work upon. Thus when crude mercury is dissolved in aquafortis, though held imperceptibly in the menstruum; yet when that menstruum is diluted with water, and a copperplate is suspended in it, the menstruum leaves the mercury, to work upon the copper, and the mercury subsides unaltered and in its own natural form; the mercury, therefore, in this operation, was only divided into its integrant parts, or small parcels of the same nature and properties of the whole; but when artificial cinnabar is resolved or divided into crude mercury and sulphur, neither of these are of the same nature and properties with the cinnabar, and are not its integrant but its constituent parts. This therefore is the dividing a body into its constituent parts or principles.

INTEGRITY of the Action. See **ACTION**.

INTEGRUM FOLIUM, among *Botanists*. See **LEAF**.

INTEGRUM, in *restitutio*. See **RESTITUTION**.

INTEGUMENTS, in *Anatomy*, the coverings of the body; the word is generally employed with the epithet *common*, as they are of the same nature and number in all parts of the frame. They consist of the cuticle or epidermis, with its appendages the nails, of the rete mucosum, and of the true skin, cutis; or dermis. The hair in its

nature seems to resemble the cuticle; but it grows from the cutis. To these three layers a fourth is sometimes added, under the name of the *adipous membrane*. In truth, the skin is always connected to the subjacent organs by cellular tissue, the interstices of which in most cases contain fat, but not invariably so. This connecting stratum belongs entirely to the cellular organ. See **CELLULAR Substance**.

To the technical expression of common integuments, the word *skin* corresponds in common language; but this term is often used by anatomists to denote the cutis, in opposition to the cuticula.

The three parts composing the integuments of the body are so different in their organization and functions, that we cannot approve the common arrangement, by which they are all considered together as forming one organic system. We prefer the method of Bichat, who describes the cutis, with the mucous layer on its surface, under the name of the *dermoid system*; the cuticle with the nails under that of *epidermoid system*; and the hairs under that of *hairy system* (*système pileux*). We shall employ this division, and derive our account of the subject chiefly from the *Anatomie Generale* of that writer.

Dermoid System.—The surface of the body is covered in all animals by a more or less dense membrane, generally proportioned in its thickness to the volume of the body, and serving the purpose of protecting the subjacent organs, of separating a considerable portion of the residue of nutrition and digestion, and establishing the relations between us and surrounding objects. In man it is the sensitive limit of his frame, placed at the extremity of his sentient powers, incessantly exposed to external impulses, thus giving rise to the relations of his animal life, and connecting his existence to that of external objects. This covering is the skin or cutis.

Being every where proportioned to the external parts over which it is applied, it follows their chief inequalities, rendering the large projections very sensible, but concealing a great number of the smaller: hence the different appearances of the body in its entire and flayed states. It is continuous throughout, and reflected at the different openings into the interior of the body, giving origin to the mucous system. The limits of the two systems are constantly marked by a reddish line, the mucous being within, and the dermoid on the outside of that boundary. The demarcation, however, is not so decided in the organization as in the colour; they appear to be insensibly blended. The dermoid system becomes thinner in the neighbourhood of these openings, particularly about the face. At their commencement the mucous organ borrows more or less of the characters of the dermoid.

The external surface of the dermoid system is every where contiguous to the epidermis, and is remarkable on account of the hairs implanted in it, of the oily matter which habitually covers it, of the sweat which is deposited on it, and of the sense of touch residing in it. We shall disregard these points at present, and confine ourselves to the consideration of the external forms of the system.

Various kinds of folds are seen on the external surface.

1. Some depend on certain superficial muscles, which, adhering closely to the dermis, and almost consolidated to its substance, throw it into wrinkles when they contract. Such are the wrinkles of the forehead produced by the *epicranius*; the radiated folds round the eyelids formed by the *orbicularis*; those of the cheeks by the *zygomati* and *levator anguli oris*; those round the mouth when the lips are contracted by the *orbicularis oris*, &c. These folds arise from the circumstance that the skin cannot contract

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as the muscles do; and they are of the same nature with what we observe in mucous surfaces, particularly in the stomach, when the contiguous muscular plane is contracted. Hence their direction is always perpendicular to that of the subjacent muscles, whose fibres they cut at right angles. As the motions of these parts in the human countenance are much influenced by the passions, the wrinkles and irregularities in the face are highly important in a physiognomical point of view. The repeated actions of particular muscles, under the habitual impression of particular passions, produce permanent lines, which give the character of the individual.

2. Other wrinkles arise from the motions of parts, but not from those of the subjacent muscles: such are those of the palm and sole. Here there is no sub-cutaneous muscle adhering to the skin, except the palmaris brevis, which has no share in producing the folds, where the skin is habitually modified by the flexion of the organ. To this class belong the impressions at the articulations of the phalanges. In the palm there are three principal ones: at the basis of the thumb, produced by the motion of opposition of that organ, at the front of the palm, by the flexion of the fingers, and in the middle of the palm. The cutis forms folds in these depressed lines when the palm is rendered hollow. Numerous other small folds, corresponding to less marked and frequent motions, cut the former at various angles.

In the back of the foot and hand we observe numerous wrinkles at each articulation of the phalanges, when they are extended: they disappear on flexion, and arise from the skin being looser and more copious in these parts to accommodate the motions. There are analogous folds at most of the articulations, but they are less strongly marked, because the skin is less adherent to the neighbouring organs. Over the whole trunk, on the arm and fore-arm, the leg and thigh, no depressions are observed except those produced by muscular prominences.

3. A third kind of wrinkles, or rather of cutaneous impressions, which are very inconsiderable, occurs particularly in the sole and palm, where they are easily distinguished from the foregoing. They indicate the rows of papillæ: and nothing of the kind occurs on the surface of the trunk.

4. Lastly, there are the wrinkles of old age, the nature of which is quite different. When the sub-cutaneous fat has begun to disappear, the skin is too large for the parts which it covers: it loses its contractility by age, and cannot therefore accommodate itself to the altered bulk of parts. Thus, where there was most fat, as in the face, the wrinkles are most strongly marked. When young persons are suddenly emaciated, the skin contracts, and no wrinkles ensue.

The internal surface of the skin corresponds every where to the cellular tissue, which is loose on the trunk, the thighs, arms, &c. and more dense on the cranium, hand, &c. In most animals, a muscular plane, named panniculus carnosus, and analogous in its form to that which is every where connected to the mucous membranes in man, separates the skin from the other organs, and imparts to it various motions. Traces of such a structure occur in a few instances in man, as in the latissimus colli, the epicranium, and the muscles of the face.

The cellular tissue connects the cutis to muscles almost universally in the trunk; but it has nothing to do with the motions of these muscles, and receives from them no sensible influence. It is separated from the muscles in the limbs by aponeuroses. Many vessels pursue their course under it: large veins may be observed through its substance; numerous arterial ramifications are distributed on its surface; and nerves are found among these.

Organization of the Dermoid System.

1. *Proper Tissue of this System.*—This comprehends, 1st, the corion; 2dly, the rete mucosum; and, 3dly, the papillæ or villi. The corion is the essential part, which determines the thickness and form of the skin: the rete mucosum is not very distinct from it; and the papillæ manifestly grow out of it.

The corion is always white in the human subject. Its thickness varies considerably. In the head it possesses opposite characters on the cranium and the face: in the former it is very thick and dense in its texture, in consequence of the numerous hairs which traverse it: in the latter it is every where thin and delicate, but more particularly in the eyelids and lips. On the posterior part of the trunk, and especially along the back, its thickness is nearly double that which it has in front, where it is nearly uniform in the neck, chest, and abdomen. We must except, however, the penis, scrotum, labia, and breasts, where its texture is much thinner. The corion is nearly of equal thickness in the shoulder, arm, and fore-arm; in the hand its thickness is rather increased, and more so in the palm than on the back. It is generally much thicker on the thigh and leg, where there are more bulky muscles than in the arm and fore-arm. It grows thicker in the foot, but less so in the dorsal than in the plantar region, which is the thickest part of the system. The relation of its functions to the various degrees of thickness observed in the hand, foot, and cranium, may be easily understood; but in other parts we do not clearly see the reason of these differences.

It is generally thinner in women than in men, so as to present a sensible difference when the two are contrasted in any region of the body.

In order to examine the interior structure of the corion, it should be carefully separated from the cellular and adipous tissue, to which the inner surface adheres more or less closely: we shall then find that surface differently disposed in the different regions.

1. In the sole and palm we see an infinite number of whitish fibres, shining like those of an aponeurotic nature, detached from the inner surface of the skin, decussating each other in every direction, leaving, particularly towards the heel, numerous areolæ of different sizes filled with fat, and gradually lost in the sub-cutaneous tissue. Hence there is not the same mobility of the skin over the covered parts, on these surfaces, as in most other situations; an arrangement well suited to the functions of prehension and support belonging to these parts.

2. The cutis of other parts of the body has these fibres much less distinct, not interwoven with the cellular tissue, and separated by smaller areolæ: hence it is much looser, and more easily dissected from the subjacent parts. The areolæ represent a vast number of openings placed irregularly by the side of each other, and lodging small masses of fat: when these are carefully removed very sensible vacuities are left. The fibres, which form them, are sufficiently close to give the appearance of an uniform structure perforated by numerous apertures. These areolæ are very favourable to the action of the tanning principle, which is introduced through them to the corion much more effectually than it can penetrate on the opposite side. Bichat ascertained this point by a direct experiment on the human skin. Chaptal has observed that the epidermis is a real obstacle to the action of tanning, and that its removal, with that of the hair, is an essential preliminary for this reason: but that the hide, even when thus prepared, is affected much more easily on the inner than on the outer side.

5. On the back of the hand and foot, as well as on the forehead, the corion does not exhibit these numerous openings on its inner surface; it is smooth and whitish, particularly after being macerated a little: the same observation may be made concerning that of the scrotum, prepuce, and labia. Its tissue is more compact, and exhibits no intervals; so that although it is thinner than on the limbs and trunk, it contains nearly as much substance. In that, which corresponds to the hair and beard, we observe only the openings necessary for the transmission of those parts.

The three great modifications in the organization of the skin, which we have just described, are merely differences of form, and not in the essential nature of the organ. The areolæ may be seen in all parts, where they exist at all, by means of maceration, which is a very good method of examining the structure of the skin. Immersion in water softens the skin by separating the fibres of its corion, and rendering their intervals more distinct; we then find that the areolæ are not confined to the internal surface, but are prolonged into its substance, which is penetrated by them in its whole thickness. These areolæ do not terminate in cul-de-sacs towards the external surface, but they open on that surface by numerous holes very apparent in skin, which has been macerated for a month or two. The epidermis must be removed in order to render them sensible: they penetrate the skin obliquely, and admit in some parts and some subjects the introduction of a pin's head. They are simple communications from the interior to the exterior for the passage of hairs, exhalants, and absorbents, as they come to the surface: thus the subjacent areolæ are merely cells containing the blood-vessels, and the tissue of the skin altogether is a true cellular net-work, of which the interstices are very distinct on the inside, but less obvious externally. Thus the corion constitutes the basis or skeleton of the cutaneous organ, lodging in its areolæ all the other parts of the organ, and giving to them their proper form.

Bichat considers that the areolar tissue, which composes the corion of the skin, has much analogy with that of the fibrous system. Its density and resistance are nearly the same in the heel: it becomes yellowish and transparent by boiling; it resists maceration for a long time; and it receives in some situations the insertion of muscular fibres. Yet the sensibility and the diseases of the two systems differ altogether.

The acute sensibility of this organ does not reside in the areolar tissue of its inner surface, but in the part containing the papillæ. And we find that the same part is the seat of most cutaneous eruptions. The external surface only is coloured by the blood in erysipelas; and hence slight pressure, by driving this fluid into the deeper vessels, removes the red colour. In measles, scarlet-fever, &c. the redness is also superficial. Injections occasion much greater redness of the external than of the internal surface; as the arterial trunks are found in the latter, and the numerous exhalants in the former. These considerations prove clearly that the cellular tissue of the skin has much less vital activity than its outer surface; that this tissue is foreign to almost all the great phenomena occurring in the skin, particularly those of sensation and circulation, which take place in the papillæ and the reticular body. Its functions, like those of the fibrous system, suppose it almost always in a passive state, as they consist merely in shielding the body, and protecting it against external agents. Its properties are well suited to this office of a general protecting medium. Very large weights are supported by slender strps of skin, and dragging in any direction tears them with great difficulty. Yet this resistance

is still much less than when the corion has been submitted to the action of the tanning principle. After such preparation it offers the strongest connecting medium which we have in the arts: no other tissue in the animal economy, except the fibrous, unites in so remarkable a degree pliability and resistance.

Haller, who regarded cellular substance as the principal component part of most organs of the human body, and particularly as forming the basis of membranes, describes the cutis as being made up of this tissue in a condensed form. "Its structure," says he, "is on the whole the same as that of membranes; viz. made of short, intricate, and closely-adhering threads and laminæ. Its external surface is dense; the internal is gradually resolved into the cellular texture, so that there are no accurate limits between the two parts. Under maceration it swells and becomes loosened, and separates into its component laminæ and fibres, both in man and animals." *Elements Physiolog. t. v. p. 3.*

The *rete mucosum*, or reticular body of the skin, is so called from its supposed perforations by the papillæ and the hairs, and because it appears of a soft mucous nature. It was first noticed by Malpighi, after whom it is sometimes named rete Malpighii. The colour of the surface of the body seems to reside entirely in this membrane: Riolan said that the cause of the black colour in the negro is in the epidermis, and does not go so deep as the true skin. Malpighi, by shewing the distinction between the cuticle and rete mucosum, demonstrated the true seat of the colour of the body. "Ex quo," says he, "deduco non incongruam forte nigredinis Æthiopum causam: certum enim est ipsis cutam albam esse sicuti et cuticulam, unde tota nigredo a subiecto mucoso et reticulari corpore ortum trahit."

The rete mucosum in the negro is a thin black layer, about as thick as the cuticle itself. Putrefaction easily detaches it with the cuticle from the cutis; but it can hardly be separated from the former. It dissolves in water, and communicates a turbid cloud to it, like that produced by the pigmentum nigrum. Mr. Cruikshank describes it as being "double, and consisting of a grey transparent membrane, and of a black web, very much resembling the nigrum pigmentum of the eye." The demonstration of this reticular body is much less easy in the white races than in the negro; and indeed very little seems to be known concerning its anatomy in the former. "Most authors," says Bichat, "represent the rete mucosum as a mucous stratum interposed between the cutis and epidermis, and pierced by a large number of openings for the passage of papillæ: but I do not understand how this can be demonstrated on detaching the cuticle, if it be fluid according to the usual description. I have employed, for discovering it, several means, none of which has succeeded. So closely does the cuticle adhere to the cutis, that they cannot be separated without injuring one or the other in the recent state. Yet, if we succeed in an attempt of this kind, there is no appearance of mucus on the corion. After a longitudinal section, particularly in the foot, where the epidermis is very thick, the line of distinction between it and the corion is very manifest: but nothing escapes from between them. When the cuticle has been removed, after boiling the skin, nothing remains on either of the surfaces. Maceration and putrefaction, but particularly the latter, produce a kind of viscid covering on the skin, very obvious when the epidermis is detached: but this is produced by decomposition, and nothing of the kind is seen under ordinary circumstances. I believe, from all these considerations, that there is no substance deposited by the vessels on the surface of the cutis, and forming an exterior covering in the sense in which Malpighi has represented the

matter. I think we should understand, by the reticular body, an inter-texture of extremely fine vessels, the trunks of which, already very minute, after passing through the numerous perforations of the corion, are ramified on its surface, and contain different kinds of fluids. The existence of this vascular net-work is placed out of all doubt by minute injections, which entirely change the colour of the skin on the outside, without altering it much internally. This is the principal feat of the various eruptive disorders, most of which are altogether foreign to the corion.

"We may then conceive the reticular body as a general capillary system, surrounding the cutaneous organ, and forming, with the papillæ, a stratum intermediate to the corion and epidermis. In the white part of the human race this system contains only white fluids; in the negro they are black, and of various tints in the other varieties of our species. The enumeration of the different shades of this organ, and the consideration of the causes of these varieties, belong to the natural history of man. Hitherto we have very few data concerning this substance: it does not seem to circulate in the part. We see that the negro's skin is black, and we know very little more. The rete sometimes adheres to the cutis, but generally to the cuticle, when they are separated after maceration. It is manifestly foreign to both, since they have the same colour in the dark as the white races."

It seems really to be a matter of doubt, whether in the white races there be any colouring-matter in the exterior capillary system analogous to the black substance of the negro, or whether the colour of their surface arise merely from that of the cutis and cuticle. That there is some colouring-matter is rendered probable by the singular anomaly exhibited in the *albinos*; which see. We can demonstrate in that case the absence of the pigmentum nigrum of the eye, and we see clearly the deficiency of colour in the hair. The peculiar dead white of the skin is referred, by analogy, to the want of the colouring principle in that organ. There is generally a connection between the colour of the skin, hair, and eyes, which is remarkably evinced in this instance. A dark complexion is accompanied with black hair and dark eyes; and the light irides, as the blue and grey, occur in individuals with red, flaxen, or other light shades of the hair and light skin. All these circumstances lead us to conclude that the skin, hair, and eyes have their colour dependent on some peculiar matter, the tint of which follows a general law in all these parts.

Even in the white races certain portions of the skin sometimes exhibit a dark colour. The areola round the nipple becomes black or dark brown in women who are somewhat advanced in pregnancy, and affords a very sure mark that they are pregnant. Haller says that he saw the skin of the pubes in a woman approaching nearly to that of the negro in blackness; and Albinus mentions a similar circumstance in a man.

The colour of the skin is transmitted to the offspring, and is surprisingly altered by intermarriages of the different races. Where a black and a white individual copulate, the offspring has the middle tint between those of its parents. If the child of a black man should intermarry with a white person, and their child with another white individual, and so on, the offspring will be white in the fourth generation; or *vice versa*. But the detailed consideration of this subject belongs more properly, to natural history.

The colour of the cutaneous organ in the white races of the human species is much modified by accidental circumstances. Exposure to the sun's rays produces various shades of a reddish-brown colour, which effect is commonly

called tanning: this alteration is very rapidly produced by going much on the water, in consequence of the reflection of the light from its surface. That this is the consequence of the cause just assigned, and that the effect is not produced by heat, is rendered obvious by the difference of colour in the face and hands, and on those parts of the body which are habitually covered: also by the brown tint of the face produced by a summer's sun, which offers a remarkable contrast to that of the forehead, where it is protected by the hat. Our clothes do not prevent the action of heat upon the skin, but will intercept the luminous rays. The pale and fallow tints of the inhabitants of large towns, compared to the florid countenances of country people, arise from the same cause. Men are blanched like plants when shut out from the influence of the sun. Tanning takes place much more quickly in individuals of light complexion, than in those of an opposite character. The effect in all cases is temporary, and goes off when the cause no longer acts. It is produced in a greater and more permanent degree in white individuals who move into warm climates: but neither here nor in any other instance is it transmitted to the offspring. Physiologists have chosen to represent this as a change occurring in the rete mucosum; on what authority we do not know. The light brown spots, called freckles, which occur about the head and neck when exposed to sun and air, seem to be of the same nature with the tanning. The colours impressed on the skin in the operation of tattooing, reside in the cutis, and consequently remain when the cuticle and rete mucosum have been destroyed by maceration. These colours are permanent: they remain through life, and the marks can only be destroyed by removing the skin which contains them; a circumstance which is hardly reconcilable to our notions of the constant changes of decomposition and composition in all parts of the frame.

Mr. Cruikshank describes a vascular membrane as existing between the rete mucosum and cutis; and apparently it is the same as the vascular net-work of Bichat. He injected this in the skin of persons who had died of small-pox; and was led to investigate the matter from a conversation with a gentleman who conceived that he had injected vessels in the rete mucosum. He macerated in putrid water, during the summer, portions of small-pox skin, which had been kept for some time in spirits. "Cuticle and rete mucosum were already turned down; and upon the eighth or ninth day I found I could now separate a vascular membrane from the cutis, in which were also situated the injected small-pox pustules. These last consisted of circles of long-floating villi at the circumference, but of a white uninjected substance in the centre. This central part Mr. Hunter had previously said was a slough formed by the irritation of the variolous matter. The surface of the skin, from whence this membrane was separated, was elegantly porous. The pores now appeared exceedingly more numerous, and this surface of the skin was still tough and shining. I macerated the same skin for four or five days more, and separated another membrane, more delicate than the former, but also vascular. The former I easily preserved; the latter, attracted by the instrument that separated it, or unable to bear the agitation of the water or spirits in which it was separated, constantly broke down. But the corresponding surface of the skin was still tough and shining; the pores were now much larger and more distinct than before, and convinced me that the appearance was natural, and that the skin had sustained no real injury in the process." Experiments on the insensible Perspiration of the Human Body, &c. p. 38.

It has generally been stated that the rete mucosum is not regenerated when it has been destroyed in ulcers; and conse-

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quently that the cicatrices of blacks are always white. We believe that this point is not clearly proved.

Whatever opinion we may form concerning the different strata described above, as intervening between the cuticle and cutis, whether we regard them as distinct membranes, or as portions detached by art from the cutis, they are of importance, as containing an extensive distribution of capillary vessels. Independently of the colouring matter, these vessels seem ordinarily to be filled with white fluids: the exhalant pores, which furnish the matter of perspiration, arise from them, and the same vascular net-work is the seat of erysipelas, and of all the cutaneous eruptions which do not affect the corion.

"The blood," says Bichat, "does not penetrate this capillary system in the ordinary state; but numerous causes will lead to its being suddenly distended. Rub the skin a little roughly, and it is instantly reddened. Irritate it mechanically or chemically, its sensibility is immediately awakened, it becomes filled with blood, which could not enter before, and is reddened in a surface proportioned to the extent of the irritation. The cheeks exhibit an analogous phenomenon in blushing; and all rubefacient membranes shew the great tendency of the superficial capillary system to admit, under circumstances of excitation, that blood which it rejects in its natural state. Blisters, and fire, applied to a degree short of destroying the surface, act in the same way: they cause a sudden species of erysipelas, which is followed by an abundant serous exhalation under the cuticle.

"Irritation of the skin is not the only cause which determines an influx of blood into the exterior capillary system. Whenever the action of the heart is accelerated, and the motion of the blood consequently precipitated, there is a tendency to this passage, as we see clearly after violent exercise, or on the access of the hot stage in fevers.

"The capillary system of the face is more subject to this sudden influx of blood than that of any other part. This is seen in the two cases just mentioned, of exercise and fever, where the action of the heart is accelerated. In various diseases of internal organs the facial capillaries are sympathetically affected, and produce redness or paleness of the countenance; and their distention always gives to the face in asphyxia a livid tint, which is confined to that part. In deaths resembling asphyxia, where the circulation becomes embarrassed in the lungs, and in apoplexy, the head is equally remarkable for its lividity. Three circumstances may be noticed, in explanation of this great susceptibility of the facial capillary system for the admission of blood; 1st, the ordinary redness of the cheeks shews that blood is habitually contained in these capillaries in a certain quantity, which is not the case in other parts; 2dly, anatomical injections shew us that the arteries communicate here more freely with the capillaries; fine injections colour the face much more deeply than other parts; and, 3dly, there is a more acute sensibility in the face; a slight blow will bring the blood into the cheeks in an instant, although it would produce no redness in the arm.

"The blood quits the capillaries of the face as quickly as it enters them; the passions produce here, almost in instantaneous succession, the lively red of a febrile attack, the deadly paleness of syncope, or any intermediate shades. Thus the face becomes well adapted to serve as a kind of scene, painted successively by the passions with numerous shades, which are effaced, return, and undergo a thousand modifications according to the state of the mind.

Let me observe further on this subject, that the passions have a threefold mode of expression in the countenance; 1st, by the capillaries which, being altogether involuntary, often

betrays what we should be inclined to conceal; 2dly, the muscular motions, which contract or expand the features to express the sad or the joyful affections, and thus produce the wrinkles already noticed; and, 3dly, the eye, which, as Buffon observes, not only receives sensitive impressions, but also expresses mental emotion. The two latter are in some degree voluntary; we can feign them, although we cannot deceive with the first.

"The tendency of the facial capillaries to become distended with blood, disposes them to numerous morbid affections. Erysipelas frequently attacks this part; variolous pustules are particularly active here; and several eruptions occur more frequently in the face than in other situations.

"We must therefore distinguish two parts in the capillary system exterior to the corion. One contains habitually the colouring matter of the skin, which is at rest, or experiences at least no other motion, than the slow and almost insensible one of composition and decomposition, and which therefore never exhibits such sudden changes as we have just described. Though the other fluids are habitually circulated, and are constantly escaping by transpiration; their place is often supplied by blood. We know of no communication between these; they appear to be absolutely independent. Some white fluids remain in the latter part at the time of death, as the following experiment will prove. Immerse a piece of skin in boiling water for a short time, and the epidermis will be elevated into numerous small vesicles containing a serous fluid."

The *papillæ* of the skin are small eminences of its external surface, supposed to perforate the reticular body, and consequently to be contiguous by their extremities to the epidermis; they differ in form in various situations, and are called villi where they are small and fine. Malpighi first observed in animals, and particularly in the foot of the pig, that the external surface of the skin is not level, but elevated into certain prominences under the cuticle. This structure does not belong to the whole surface of the cutaneous organ, which, although rather unequal in consequence of small risings about the hairs, has no regularly arranged parts deserving to be called papillæ. Thus Ruysch could find nothing of this kind on the back of the foot, and acknowledges that they are obscure in other parts, and only to be seen after injections; and other anatomists have experienced considerable difficulty in detecting these parts, even with the assistance of glasses.

"Neither," says Bichat, "are we to mistake for papillæ the numerous and very sensible tubercles, which make the skin of certain subjects very rough. These consist of small cellular and vascular fasciculi, or of sebaceous glands found at the openings of the corion under the epidermis, through which the hairs are transmitted; elevate the external surface, and thus cause projections. Maceration for two or three months converts these bodies, which always contain a little fat, into the firm, whitish, unctuous and spermaceti-like substance always produced from adipous matter by maceration; the skin at the same time becomes soft and pulpy, and is loosened round these tubercles, which are clearly seen to be continuous with the subjacent fat. These prominences are more frequent on the limbs and back than on the front of the trunk; and they are more numerous in the former, on the aspect of extension than of flexion. The absence of these risings, and a consequent smoothness of the outer surface of the corion, belong to our notion of a beautiful skin; and this character belongs much more to the cutaneous organ of women than of men. The epidermis covering these prominences is often detached in scales, particularly by any rather strong rubbing; and this contributes still more to the

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roughness and harshness of the skin; it might lead us to suppose that the epidermis forms them, although it is only accessory. Where the latter is thick, as in the palms and soles, these cutaneous tubercles are never seen."

The proper papillæ of the skin are very visible in the hands and feet, and may be seen when the cuticle has been carefully removed after simple maceration for a sufficient time; but still more plainly when the cutis has been minutely injected previous to the macerating process. We observe narrow, longitudinal, and slightly prominent lines in the cutis, distributed spirally at the ends of the fingers and toes. From these ridges arise very small conical processes like fine threads or hairs, slightly inclined towards the nail, shorter and more imperfect in the smaller toes and fingers; they give a rough villous appearance to the surface, which is represented in the seventh figure of Mr. Cruikshank's work on the insensible perspiration. They are very distinct in the red part of the lips, where they are numerous and long, and produce a villous appearance; Ruysch has figured them in his eighth *Theaurus*. The soft and spongy skin of the glans penis is remarkable for a similar structure, which is well represented by Albinus in the *Annot. Acad. lib. iii. tab. 4*. They are more obtuse in the female mammae. The minuteness of these organs renders it difficult to ascertain their internal structure satisfactorily. They receive numerous blood-vessels, so as to become much more deeply tinged by coloured injections than the surrounding skin. They receive numerous nerves, and have generally been regarded by anatomists in a particular manner as organs of a nervous structure. That a considerable supply of nerves is bestowed on those parts of the skin which have these papillæ is very clear; but, that the minute filaments can be traced into the very prominences, and that they lay aside their coverings, so that the nervous pulp is bare in them, must be regarded as inferences from analogy rather than from direct observation. The density of the corion, and the extreme slenderness of the nervous threads, are almost insuperable obstacles to our tracing the nerves into the papillæ.

We can scarcely doubt, says Haller, that these bodies are the organs of touch, when we observe them larger, more distinct, and receiving a greater supply of nerves where this sense exists in the most acute degree, hardly discernible in other situations; and particularly calculated by their prominence to be impressed by external objects. Perhaps their existence in the sole of the foot, where they are covered by so thick a cuticle, is hardly reconcileable with this opinion.

That the vessels, which they contain, contribute to the separation of the matter of perspiration, is so conformable to general analogy, that we can easily admit it. Mr. Cruikshank was disposed to regard them as the organs of cutaneous absorption from their resemblance to the intestinal villi, on which he discovered the orifices of the lacteals.

Effect of various Agents on the Dermoid Tissue.—We have noticed already, under the head of the rete mucosum, the action of light upon the living skin.

The action of caloric on the living integuments presents different phenomena, according to the degree in which it is applied. A warm atmosphere relaxes its tissue, increases its action, and promotes the evacuation by the exhalants of the residual fluid of nutrition and digestion. It is contracted and corrugated by cold, and refuses to admit these fluids, which then go off chiefly by urine. The gradual change from one to the other of these states does not produce any unpleasant effect: but sudden vicissitudes are not so free from danger. The cold produced by the evaporation of the cutaneous exhalation, enables the human subject to preserve his ordinary temperature in air, heated above the degree of

boiling water. See the very curious facts on this subject detailed in the article *HEAT, Animal*. The interruption of the cutaneous discharge on the corrugation produced by cold suspends this evaporation, and thereby prevents the temperature from being lowered beyond the natural standard.

When more considerable heat is applied to the skin, it produces first a sensible redness, which is followed by vesications. If it be increased in degree, the texture of the organ is destroyed; it is hardened and curled up, like any other animal tissue when burnt; beyond this point it is blackened and converted into a coal. The first operation is on the vital powers of the organ, and consequently can take place only during life: the latter effects are produced on the tissue, and may be exhibited in dead skin. The latter, when heated, contracts, and then swells, exhales a fetid odour, and leaves a dense charcoal, difficult to incinerate. On distillation it yields the same products as fibrine. Intense cold produces in the first place a redness of the organ, as in the nose, ears, fingers, &c. of individuals exposed in a very cold climate: inflammatory action and mortification ensue. The latter occurs immediately on the application of high temperature, but after some interval in the opposite case.

The air evaporates and carries off habitually the matters secreted from the skin: and when this effect is not produced, they are accumulated on the surface, and render it moist. This evaporation is a physical phenomenon entirely distinct from the vital action of transpiration. The latter takes place in a warm bath, as well as in the air; but in the former case the fluid is dissolved by the water. Does free exposure of the skin to air increase or diminish the amount of its exhalation? The common opinion seems to be that the latter effect is produced; the exhaling pores are supposed to be obstructed by the impression of cold on the skin. Dr. Stark, however, proved by direct experiment in his own person, that the body lost more weight in a given time when naked, than when covered by the ordinary clothing.

Moisture of the skin may be produced in two perfectly distinct ways; 1st, by increased exhalation, which may arise from accelerated action of the heart, as in violent exercise or fever; from relaxation of the organ by the warmth of the air, or by baths; or from sympathy, as in consumption, fear, &c. Under all these circumstances the increased discharge will keep the skin moist. 2dly. The same effect will be produced by insufficient dissolution of the perspiration when it is produced, as in bed, or in damp weather.

When the air has access to dead skin on all sides, it is dried, and becomes transparent, unless it should contain blood; it is then firm, but admits of being bent. In this state it yields very little to external agents, does not readily absorb moisture, and has no disagreeable smell. Hence skins simply dried are of great use in the arts, and afford serviceable and pleasant coverings; hence, too, probably the great durability of the mummies.

If the skin be left on the body, or exposed in moist air, it putrefies, assuming successively a brown, a greenish, and lastly somewhat black colour. It exhales a most fetid odour, and becomes swollen by the liberation of gas. A fluid mucus appears on its surface, from which the epidermis is then separated. When all the fluids are evaporated, a blackish substance remains.

Water removes from the living skin those parts of the perspired matter which are not dissolved by the air; and the use of bathing, which is much neglected in these days, must be regarded as an efficacious means of preserving the surface, free from acrid and irritating matters, and consequently in a state of health. We cannot state precisely what action baths have on the living skin; we are told indeed that they relax
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and soften, or constrict and brace; but no precise meaning is attached to these vague expressions. They seem to affect the vital powers of the part, to augment or diminish them, but we know of no influence on the tissue.

After macerating the skin for some hours in water, with agitation and pressure, evaporation of the fluid yields a little gelatine. When macerated longer it becomes softened, and sensibly whiter, swells a little, and remains for a long time without undergoing any other alteration than a degree of putrefaction, much less than what occurs in the muscular, glandular, and other tissues. This putrefaction is more marked on the surface in contact with the cuticle, but at the end of two months the skin has lost but little of its consistence; it begins to be reduced into a fetid pulp at the end of three or four months. According to Fourcroy, spontaneous decomposition in water or moist earth converts it into a fatty matter, and into ammonia, which compose a kind of soap. It produces very little froth when boiled. Just before ebullition commences, so as always to be convex on the side covered by the epidermis, and concave on the opposite; the fibres are contracted and condensed at this time, and the contraction is greater on the inner surface, where the intervals are the largest. At the same period small vesications are observed. This crispation of the skin renders it dense, hard, and elastic, but reduces its dimensions. It soon acquires a semi-transparency and yellowish colour, like that of the fibrous organs when boiled. The hardness which it had acquired at the instant of crispation is now gradually lost; the skin is softened, yields much gelatine to the water in which it is boiled, but instead of diminishing, is rather increased in thickness. All appearance of fibres is lost in this stage; a semi-transparent, gelatinous, and homogeneous mass remains; still it does not lose its elasticity; probably the large quantity of gelatine, which it contains, occasions it to retain this property. The slightest motion excites in it a general vibration as in the different animal jellies. By a continuance of the boiling nearly the whole gelatine is dissolved, constituting a viscid liquor, which by proper evaporation is converted into glue; and a small membranous residue only, which is dissolved with great difficulty, remains; a long time is required to reduce the skin to this state. From this solubility in water, the cutis of animals is mostly employed in the manufacture of glue.

Sulphuric, nitric, and muriatic acids act on the skin, as on any other animal substances, but much more slowly, particularly on the surface covered by the epidermis. The first reduces it quickly to a blackish pulp; the two others, even in a concentrated state, bring it less readily into a pulp: the oxymuriatic acid produces very little effect on it. Nitric acid converts it into oxalic acid and fat, while, at the same time, azotic gas and prussic acid are emitted. Acids do not act in this way during life: they never produce this pulpy state of the organ. A piece of caustic, enveloped in a portion of skin, is reduced to a yellowish-red thick fluid in the course of a day: the skin is crisped and contracted, but not penetrated; its tissue does not even appear injured on the surface. Alkalies have different effects, according to circumstances, in the living state; they destroy some granulations much more readily than others. An alkaline lixivium, applied to the surface of the body, causes an unctuous and slippery feel, as its combination with the unctuous matter produces a soap. Concentrated alkalies dissolve the dead skin, converting it into oil and ammonia.

"The cutis," says Dr. Thomson, "appears to be a peculiar modification of gelatine enabled to resist the action of water, partly by the compactness of its texture, and partly by the viscosity of the gelatine, of which it is formed; for

those skins which dissolve the most readily in boiling water, afford the worst glue. Mr Hatchett has observed that the viscosity of the gelatine obtained from skins is nearly inversely as their flexibility, the supplest hides always yielding the weakest glue; but this glue is very soon obtained from them by hot water." *System of Chemistry*, v. 5. p. 575.

The production of leather, by the action of the tanning principle of vegetables upon the skin, is a subject of such importance, that it would be useless for us to enter on it here: it will be considered separately in the articles of the dictionary relating to tanning: further information on the chemical properties of the skin may also be derived under the heads *GELATIN, GLUE, &c.*

Very little is known of the chemical constitution of the rete mucosum. Oxymuriatic acid deprives it of the black colour, and renders it yellow in the negro. Beddoes states that immersion for some time in water, impregnated with that acid, will discharge the colour in the living subject. (*On Factitious Airs*, p. 45.) Fourcroy mentions that the foot of a negro, after a similar exposure, nearly lost its colour, but that the original black hue returned in a few days. *Syst. des Connoiss. Chimiques*, t. ix. p. 259.

Common Parts belonging to the Tissue of the Dermoid System.—The skin contains a large proportion of cellular substance. Numerous prolongations of the subcutaneous cellular stratum penetrate the contiguous areolæ of the corion, then pass into the more exterior ones, and end at the numerous pores which transmit the vessels, nerves, and hairs. Thus, if the cellular tissue could be completely separated, the cutaneous organ would represent a piece of sponge, being perforated in every direction. According to Bichat, boils perform this dissection, destroy the cellular organ, and leave the skin in this cribriform state. He adds, that the corion itself is not the seat of any acute affection: that all diseases of this nature either affect its surface, or the cellular tissue of its areolæ. But it may be altered by chronic diseases; and is manifestly disorganized in elephantiasis.

In anasarca of long continuance the subcutaneous serosity gradually penetrates the cellular substance of the dermoid areolæ, separates its fibres, and sometimes arrives even at the epidermis, which it bursts; through these openings it escapes.

Probably, says Bichat, the cellular tissue does not extend so far as the external surface, under the epidermis: for when that covering is removed, no granulations are formed, although these are always produced whenever cellular tissue is exposed.

The arteries, running in the subcutaneous cellular substance, furnish an infinite number of small branches, which enter the areolæ of the skin with the cellular prolongations, anastomose at every point in the areolæ of the organ, and penetrate at last through the pores of the external surface to produce the capillary network already described, which, in the ordinary state, contains very little red blood. In this passage, through the areolæ of the skin, very few branches seem to terminate on the fibres of the corion itself.

After penetrating the skin in the opposite direction, the veins open into the large subcutaneous trunks, which in many parts may be so clearly seen through the integuments. The venous ramifications of the areolæ are nearly insensible in the natural state, but are considerably dilated over cancerous tumours, so that the skin is marked by numerous bluish serpentine lines. All gradual extensions of the cutaneous organ, as in aneurisms, pregnancy, dropsy, &c. are attended with the same phenomenon, which is never exhibited in acute cases.

Numerous and considerable branches of nerves form a kind

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of subcutaneous nervous system, producing the filaments which enter the skin. They communicate with each other in traversing the areolæ of the organ, and probably terminate on the papillæ. In the hand, where these prominences are very numerous and clearly marked, there are more subcutaneous nerves, in proportion to the surface, than in any other part.

A great number of absorbing vessels is found under the skin; inasmuch, indeed, that this is the most favourable situation for investigating them. The veins are surrounded by them, and several fasciculi are observed in the intervals of these vessels; so that we may represent the skin and aponeuroses as being separated, in the limbs, by a continuous stratum of these vessels. We must refer the origin of many of them to the corion, from the areolæ of which they carry into the blood the fat and cellular lymph, as well as the nutritive matter of its fibres. But is there, moreover, a particular order of branches opening on the epidermis, for the purpose of absorbing substances from the surface of the body under certain circumstances? Anatomical investigations do not enable us to decide this question directly: the absorbing pores cannot be demonstrated; we must therefore inquire whether the phenomena of the cutaneous functions indicate their existence. We may observe, previously, that the superficial absorbents are very numerous, and seem to be in greater number than would be required for absorbing the contents of the cellular substance.

It had long been received as an established truth, that the skin is an inhaling or absorbing, as well as an exhaling organ; that though the loss by perspiration commonly greatly exceeds what the system gains by absorption, yet sometimes, according to the varying circumstances of external relations and conditions of the body itself, the inhalation balanced, and even surpassed the exhalation. Of late this doctrine of inhalation has been called in question, and, in the opinion of many, has been completely overthrown.

The most direct argument in favour of absorption from the skin, is the action of various substances upon the body, when applied to this organ. This is shewn in a particularly clear view in the instances of opium and mercury. Dr. Currie (*Medical Reports*, chap. 19) considers, that in all such cases the article absorbed is forced through the epidermis by mechanical pressure; or that the epidermis has been previously destroyed by injury or disease; or if sound, that the article applied to it is of an acrid nature, which first irritates and erodes this tegument; and then coming into contact with the mouths of the lymphatics under it, is of course absorbed. This explanation is quite unsatisfactory. The firm adhesion of the cuticle and cutis is well known: on the supposition just mentioned they ought to be separated, which is not the fact, we ought to see the ointment under the cuticle, which is equally untrue, and the ointment should penetrate equally in the dead subject, which is not the case. However, the action of mercurial fumigations, where no friction is employed, affords a case of absorption from the surface of the sound cuticle, which cannot be denied.

On the same side of the question, it has been asserted, that water is taken up by the skin in various cases. Many instances have been known of persons at sea, with no fresh water, having their thirst much allayed by wetting their cloths with the salt water. Haller affirms, too, on the authority of Dehaen, that the body acquires an increase of weight in the warm bath: "*denique vapor aquæ calidæ in manum resorbetur, et homini in balneo constituto cutis tumet et rubet, corpus pondere augetur, fitis sedatur, et omnia signa eduntur aquæ resorbite et sanguini admixtæ.*" t. v. p. 88. Experiments have since been made with every

necessary care, which seem to contradict this position, and to prove that the body acquires no additional weight in the warm bath. Seguin, from a great many experiments of this description, concludes that there is no inhalation, because the body, so far from gaining, always lost some part of its weight during immersion, although much less than in the air in equal times. Thus, in a bath heated from 10° to 12° of Reaumur, the loss of weight was to that sustained during the same time in air as 6.5 to 17; at the temperatures from 15° to 18°, as 7.5 to 21.7; and from 26° to 28°, as 13 to 23. *La Médecine éclairée par les Sciences Physiques*, tom. iii.

In other experiments, again, as in those of Drs. Gerard and Currie, there was no increase of weight; but neither was the body in general observed to have suffered any loss during immersion in the warm bath. "When I was at Buxton," says Dr. Currie, "in 1788, I made an experiment on the effects of bathing on the weight of my body, and after half an hour's immersion, I found it rather diminished than increased. This experiment had, I believe, been made before by Dr. Pearson with the same result; it has since been repeated with great care, and it is ascertained, as a fact, that no increase in the weight of the body is produced by immersion in water at the temperature of 82°. In the year 1790, I had a patient in diabetes, whose cuticle, as is usual in that disease, was in a morbid state; and being desirous of trying how far the inordinate action of the kidneys might be affected by a gentle stimulus applied to the skin, I immersed him in a bath of the temperature of 96°, weighing him before and after immersion. There was no sensible variation in the weight. This experiment has since been made by Dr. Gerard in another case of diabetes, an account of which is given in the publication of Dr. Rollo; and as it was repeated a great number of times with the utmost care and accuracy, it may be considered as established, that immersion in the warm bath in diabetes produces no increase in weight. I have made five different experiments of the same kind on myself, varying the heat of the bath from 87° to 95°, but never in any instance found my weight augmented." (*Medical Reports*, vol. i. p. 302.) The doctor then details a case of strictured œsophagus, where the patient gradually wasted, and ultimately died of inanition, although he was immersed daily in a tepid milk and water bath.

We may observe, concerning the facts just quoted, that they by no means warrant a decisive negative inference. We have every reason to suppose that the action of the skin goes not uninterruptedly in the bath, and that the pulmonary exhalation proceeds as usual. Yet the weight either continued unchanged, or, if any loss was observed, this was constantly less, much less, than is experienced during the same interval in air: hence we may argue, that there must have been absorption. Dr. Currie's case of strictured œsophagus merits further consideration: no experiment could be more unfavourable for an opponent of cutaneous absorption. The patient, it is true, gained no weight while in the warm bath, but the loss continually going on in the air, was, as in other trials, suspended during the immersions. "It is worthy of observation, that there was neither increase nor decrease of weight in the bath; yet Mr. M. was at this time waiting twenty ounces in 24 hours, and consequently, if there was no absorption in the bath, it might be supposed that he would have lost five-sixths of an ounce during the hour of immersion. It is the more remarkable that there was no decrease, because in the bath the skin always softened, and the forehead became covered with a gentle moisture." Besides, "he always expressed great comfort from the bath, with abatement of thirst,"

thirst," and "subsequent to the daily use of it, the urine flowed more plentifully, and became less pungent." An observation precisely similar is made by Mr. Cruikshank: "a patient of mine, with a stricture of the œsophagus, received nothing, either solid or liquid, into the stomach for two months; he was exceedingly thirsty, and complained of making no water. I ordered him the warm bath for an hour, evening and morning, for a month; his thirst vanished, and he made water in the same manner as when he used to drink by the mouth." *Anatomy of the Absorbing Vessels*, p. 101.

Dr. Currie states further, concerning his patient, that the discharge by urine alone exceeded much in weight the waste of his whole body; and it cannot be doubted, he adds, that the discharge by stool and perspiration exceeded the weight of the clysters. Thus it appears that the egesta exceeded the ingesta in a proportion much greater than the waste of the body will explain." That cutaneous absorption affords the only adequate solution of this phenomenon is an irresistible conclusion. Still, however, this is denied. When forced to confess that there are cases where the egesta exceed the ingesta, and which can only be accounted for by absorption, the opponents of the cutaneous inhalation deny this function to the skin, and bestow it most gratuitously on the lungs.

Many other examples might be cited, in which the body evidently acquired weight from some other quarter than by the food or drink. Haller has many such instances. Rye and Linings gained several ounces by exposure in a moist atmosphere: and Fontana experienced a similar occurrence.

Some facts, which oppose the notion of inhalation by the surface of the skin, have been observed in the applications of medicated substances to the body. Seguin made numerous experiments of this kind, with solutions of muriate of mercury on syphilitic patients: we are informed, that in cases where the epidermis was perfectly sound, neither the known effects of mercury on the body, nor any amelioration of the venereal symptoms, was ever observed. He also immersed his own arm in a solution of two drachms of the mercurial muriate in ten pounds of water. At the temperature of 10° and 28° of Reaumur, no part of the salt was missing at the end of the experiment; but when the bath was at 18° of the same scale, there was a loss of one or two grains of the muriate in the hour, though the quantity of fluid was not diminished. It appears to us that the experiments on the whole shew that the muriate of mercury was not absorbed; we can hardly admit that two grains were taken up as stated in this account. The entrance of so large a quantity of this very active preparation into the system, must have been attended with very unpleasant effects on the subject of the experiment, which do not seem to have occurred.

The effects produced on the odorous properties of the urine, by exposure of the body to oil of turpentine, are well known. By inhaling the vapour of this fluid, the violet smell is imparted to the urine very speedily: even a single full inspiration is sufficient to produce the effect. Walking in a room where it has been spilled will operate in the same way. It has been proved by experiment that the lungs are the organs by which the absorption takes place, and that the fluid is not taken up by the skin. Dr. Rousseau, of Philadelphia, exposed his body freely to the turpentine vapour, breathing through a pipe, which communicated with the external air, and had no connection with the air of the room. No effect was produced on the urine. He immersed his arm in spirit of turpentine for two hours, luting the vessel containing it to the arm, so that no vapour could escape; no change was perceptible in the properties of the urine. He smeared his body all over several times with the spirits of

turpentine, guarding against the inhalation of the vapour of the lungs, by breathing the external air through a tube. He continued this for some time, until the surface was irritated, and the pulse quickened; the result was the same. These experiments were frequently repeated, and with the same result, whether the spirit of turpentine was employed, or camphor, garlic, or musk. *Currie's Med. Rep.* v. 1. chap. 19.

The exhalant vessels of the skin arise in the exterior capillary system, which surrounds the corion, and which affords the point of termination of the cutaneous arteries. They draw from this source the fluid which they pour out on the epidermis. We are entirely ignorant of their form, length, course and direction: but the phenomena of the cutaneous discharge, and of injections prove their existence. They do not seem to be equally abundant in all parts: in the face and chest they are numerous, so that we sweat easily in those parts; the number is smaller in the back and limbs. Sweat is very seldom observed in the palms and soles: but there is great variety in these respects in different individuals.

It appears from experiments, that a considerable discharge takes place from the skin habitually, although not in a form cognizable by our senses. This is called insensible perspiration, or transpiration. Under particular circumstances, the cutaneous discharge consists of fluids possessing very sensible properties: this is called sweat. The epithet insensible is applied to the former, to distinguish it from the sweat, but under certain circumstances it may be rendered obvious to the senses. It has been often asserted that a vapour may be observed to arise from the body, and may be recognized by its shadow against a white wall in the summer. This is observed more readily in a dense atmosphere. Haller saw a kind of cloud or smoke arising from the face, hands, and indeed every part of the naked body in the subterraneous excavations of Clausthal and Rammelsberg. A still more obvious demonstration of the transpiration is yielded by holding a finely polished metallic surface near the skin; the watery vapour is condensed by the metal, and clouds it. Under ordinary circumstances, the whole discharge is evaporated as it is produced, and passes off in this invisible form. As all bodies absorb heat in changing from a fluid to a gaseous form, this evaporation must have a very powerful effect in regulating the temperature of the animal frame. When the nature of our clothing confines the perspiration, and prevents its evaporation, an unpleasant feeling of heat is produced; this is particularly observed when the body is covered with oiled silk. On the other hand, exposure of the skin in a naked state, particularly in the wind, has a very rapid and powerful cooling effect. The importance of this function in regulating our heat did not escape the notice of that sagacious observer Benj. Franklin: "during the hot Sunday at Philadelphia, says he, in June 1750, when the thermometer was up at 100° in the shade, I sat in my chamber without exercise, only reading and writing, with no other clothes on than a shirt, and pair of long linen drawers, the windows all open, and a brisk wind blowing through the house. The sweat ran off the backs of my hands, and my shirt was often so wet as to induce me to call for dry ones to put on. My body, however, never grew so hot as the air, or as the inanimate bodies immersed in the air." (*Letters and Papers*, p. 365.) It does not appear that Franklin actually measured his heat; but he makes the inference of his comparative coolness from remembering that all the bodies about him, even the shirt out of his drawer, felt warm to the touch; and he concludes that he was kept cool "by the continued sweating, and by the evaporation of that sweat."

Probably sweat is only an increased quantity of the same kind

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kind of fluid with that of the transpiration: very small particles of fluid are observed on the skin, and they unite into larger and larger drops. Heat is the most common cause of sweating, as it is a very powerful means of exciting the action of the heart, on which this phenomenon depends in many cases: hence warm air and the warm bath are powerful causes. Strong bodily exertion, and warm food, by stimulating the vascular system, produce the same effect. Fear, and other affections of the mind, fainting, and various morbid states of the frame, also produce sweating. We cannot name any particular degree of heat at which sweating is certainly produced: and the pulse is often very greatly accelerated in disease without this consequence. Sometimes a particular part of the body only sweats: sometimes one side, as Haller has noticed in his own person.

Bichat enquires whether the nerves have any influence on the cutaneous discharge. He observes, that in palsied patients sweat takes place on the diseased as well as on the sound side. "I lately," says he, "attended at the Hôtel Dieu a patient, in whom the left side of the body was rendered perfectly paralytic, in consequence of an apoplectic attack: yet he sweated only on this side. Examples of the opposite phenomenon are adduced; but they cannot invalidate the common observation that the discharge is equal on both sides. Is it not well known, that when the nervous action is entirely annihilated in a paralytic limb, blisters affect it in the usual manner? Do convulsions, in which the nervous action is increased, augment the cutaneous exhalation? Have the states of acute sensibility, where there is in the cutaneous nerves so great a susceptibility of impressions, any known influence on perspiration? Let us then confess, that in cutaneous exhalation, as well as in secretion, we are entirely ignorant of the nature of the nervous influence, if any such exist."

The discharges by the skin and the kidney seem to be regarded by physiologists as the principal means by which the residuary matter of nutrition and digestion is expelled from the body: and they have attempted to shew the ratio which these bear to each other, to the pulmonary exhalation, and to the feces. We have not derived much information from these labours, which merely prove, in a general manner, that the discharge is effected through the internal organs in cold climates and seasons, and through the skin under opposite circumstances. In this respect, the kidney and the skin are always in opposite states in relation to each other: in winter the urine is much loaded with substances, and in summer the perspiration has a salt taste and other peculiar characters, arising from matters which it does not contain in the former season. Every individual must have observed in his own person that while he sweats freely no urine is collected in the bladder; and, that when the cutaneous discharge is interrupted, the secretion of the kidney goes on very actively.

We do not know much about the pulmonary exhalation, either as to its quantity, its nature, or its relations to the cutaneous discharge: but that the two organs very powerfully influence each other, is rendered very obvious by the phenomena of disease. The effect of exposure to cold and moisture in exciting pulmonary affections, and the disposition to such disorders in the winter, when the cutaneous exhalants are less active, are well known.

We often have occasion to observe a manifest connection between the perspiration and the alvine discharges.

When the extent of the exhaling organ, the innumerable tubes by which it is penetrated, the quickness with which we can even see the perspiration produced, are regarded, we shall expect to find that the quantity of the discharge is very considerable. Although it was known to the ancients, who

had noticed its influence on the health, and introduced it into their pathology, we find little detailed information concerning this function before the seventeenth century, about the beginning of which it became the subject of the most patient research, and of the most extensive experiments perhaps ever undertaken. Sanctorius, a Venetian physician, dedicated thirty years to his experiments, which consisted chiefly in weighing whatever he ate and drank, as well as what he discharged by urine and stool. From him the insensible perspiration has sometimes received the epithet of Sanctorian. His example was followed by several persons in different countries: by Dodart in France; by Keil, Robinson, Rye, and Home in this country; and by Linings, in South Carolina. Even our gay monarch, Charles II. amused himself with some experiments on this subject. Something must be taken from the numbers expressing the quantity of perspiration, on account of the pulmonary exhalation, the mucus of the air passages and nose, and spitting. For, in the experiments now alluded to, all the difference between the ingesta and the egesta is set down as loss by insensible inspiration.

In the experiments of Home, in Scotland, the food amounted to 4 lb. 3 oz.; the feces to $3\frac{1}{2}$ oz.; the urine to $2\frac{1}{2}$ lb., or $3\frac{1}{2}$ lb.; the perspiration, in the course of an hour, varied from two-thirds of an ounce to 4 oz., and even six under exposure in the sun. In the twelve hours of night, the perspiration varied from 12 to 18 oz.; and in $23\frac{1}{2}$ hours the discharge amounted to 3 lb. $3\frac{1}{2}$ oz.; and on another occasion, to 2 lb. $6\frac{1}{2}$ oz.

Rye, who lived at Cork, in Ireland, found the urine in the winter season to amount in one day to 42 $\frac{1}{2}$ oz.; the perspiration to 53 oz. in spring, the urine was 40 oz.; the perspiration 60: in summer the numbers were 37 and 63. The average daily quantity of urine, therefore, was rather less than 40 oz., and that of the perspiration $56\frac{1}{2}$ oz. The average daily amount of the feces was $4\frac{1}{2}$ oz.; that of the food 96 oz. The large quantity of perspiration in the winter is chiefly made up of what is produced during the night.

Keil found the medium quantity of perspiration to be 31 oz.; of urine 38; of feces 5; food 78.

Robinson allows that the urine is diminished, and the perspiration increased in a very sensible manner in the summer, so that the average number of ounces of the former is in summer 27, in winter above 30. In the summer months the perspiration and urine are as 5 and 3, in the winter as 2 and 3; in April, May, October, November, and December, they are nearly equal. In a young person he estimates the ratio of the perspiration to the urine as 1340 to 1000; in an old one as 967 to 1000. He makes the average quantity of food 86 oz., and 58 when he was old; the urine 35 and 28; the perspiration 46 and $27\frac{1}{2}$; the feces $5\frac{1}{2}$ and $3\frac{1}{2}$. Thus the food and all the excretions are diminished as age advances.

Hartman, in Germany, found the food to be 8 oz.; the urine 28; feces 6 or 7; and perspiration 45 or 46.

Dodart, in France, found that the perspiration was to the feces as 7 to 1. He estimates the discharge in summer at 40 oz. 3 dr. 26 gr.; in winter at 26 oz. 46 gr.

Sanctorius, in the warm and humid air of Venice, took 8 lb. of food; the perspiration amounted to 5 lb.; the feces to 4 oz.; and the urine in the night to 16 oz.; in the twenty-four hours to 44 oz.

Linings has given us very accurate accounts of his experiments, which were performed in South Carolina. From his labours, as well as from those of Robinson, in Ireland, it appears that the perspiration is most abundant in the warm months

months, and the urine in the cold : the former was in greater quantity during five months, and the latter during seven. The largest proportion of urine was 143 oz. which occurred in the month of December ; and of the perspiration 130 oz. in September. The average daily amount of the food, on a mean of experiments continued for a year, was 27,18 oz. ; of the drink 102,17 ; of the urine 64,84 ; of the perspiration 60,10 ; of the feces 4,35. The ingesta were to the urine, throughout the whole year, as 2,02 to 1 : but at many particular times they were as 3 to 2 ; their ratio to the perspiration as 2,18 to 1 ; to the fecal discharge as 30,13 to 1 ; and the perspiration of the whole year to the urine as 1 to 1,08. These experiments differ from those of Sanctorius and of Rye, in shewing that the urine exceeds the perspiration even in a hot climate.

It appears doubtful, says Haller, on comparing together the results of the trials made by individuals of different ages in various climates and seasons, whether the discharge by the skin exceeds that by the urine. On such a comparison we must set down the cutaneous exhalation much below the quantity assigned by Sanctorius, as it did not exceed 60 oz. in a very hot climate, and in colder countries was 56, 46, or even 30 oz.

It will be readily perceived, as we have already observed, that these calculations do not give the measure of the perspiration alone, but of the cutaneous and pulmonary discharges together. To separate these, and to determine the quantity of each, still remained an important problem, the solution of which has been attempted only of late years.

Mr. Cruikshank introduced his hand into a glass jar, and tied a bladder, fixed to the mouth of the jar, round his wrist. In less than a minute the inside of the bottle was rendered dim, as if it had been held over the steam of warm water : small drops appeared in less than ten minutes, and a teaspoonful of transparent and perfectly insipid fluid, weighing 30 gr., was collected in an hour. Assuming that the hand is to the whole body as 1 to 60, and that the whole surface perspires equally, the exhalation at this rate would be 7 lb. 6 oz. in 24 hours. When the experiment was repeated after taking exercise, 48 gr. were collected in an hour, which is at the rate of 12 lb. in 24 hours. By breathing into a bottle for an hour, this gentleman collected 124 gr. of insipid transparent fluid : the produce in 24 hours at this rate would be 6 oz. 1 dr. 36 gr. If this be added to the former statement of the cutaneous exhalation, the sum will be 8 lb. 1 dr. 36 gr. ; and the evaporation from the lungs will be little more than $\frac{1}{4}$ th of the whole. Bichat says that he collected 2 oz. of fluid by breathing for an hour into a vessel. *Anat. Gener. t. 2, p. 701.*

Mr. Abernethy collected from his hand and wrist, inclosed in a glass jar for six hours, about 3 dr. of fluid. He estimated the surface from which this was collected at $\frac{1}{4}$ th of the whole body : hence, if the perspiration be equal at all times and in all parts, the produce in one day would be about 2 $\frac{1}{2}$ lb. This result is so different from that of Mr. Cruikshank, that there must be some signal error in the data on one side or the other.

The method adopted by Lavoisier and Seguin seems calculated to afford results more worthy of our confidence. The whole body was inclosed in a silk bag, varnished with elastic gum, impenetrable by air or moisture, having a small opening carefully cemented round the mouth through which the person might breathe ; so that whatever came from the lungs escaped, while the whole of the cutaneous discharge was confined within the bag. By weighing the body, there-

fore, before putting on this dress, and immediately after leaving it, the total loss by the pulmonary and cutaneous discharges was ascertained. The amount of the loss by the lungs was known by weighing the subject of experiment just before he put on the dress, and again immediately before he removed it. When the latter quantity was subtracted from the total loss, the remainder gave the value of the cutaneous discharge. From repeated trials performed in this manner, Seguin and Lavoisier found the mean loss, by the cutaneous and pulmonary exhalations, to be about 18 gr. in the minute, or 2 lb. 13 oz. in 24 hours. The pulmonary discharge amounted to 15 oz. ; so that there remains 1 lb. 14 oz. as the mean quantity of daily perspiration.

The greatest quantity of matter perspired in a minute was 26,25 gr. troy ; and the minimum 9 gr. The quantity perspired is increased by drink, but not by solid food. Perspiration is at its minimum during meals, and immediately after : it reaches its maximum during digestion. *Mémoires de l'Acad. des Sciences, 1790 ; or in Fourcroy, Syst. des Connoiss. Chimiques, sect. 8, ord. 3.*

Our next object of inquiry is into the composition and properties of the cutaneous exhalation. As it escapes from the surface insensibly, there is a difficulty in collecting it in sufficient quantity for examination : hence its nature and composition are very imperfectly known. Lister, who collected it by placing his hand in a glass, found it to be water with a faintish or urinous taste.

The fluid collected by Mr. Cruikshank appeared to possess all the properties of pure water. When Mr. Abernethy had procured 3 dr. of fluid, he evaporated one-half : there remained on the glass a small residuum, which had a very slight taste of salt. The other half was suffered to stand many days, in which time no change appeared. It did not alter the colour of vegetable blue ; no coagulation or precipitation of animal matter was produced by muriatic acid, neither was any change caused by the addition of pure alkali. It appeared, therefore, to Mr. Abernethy, that the water of perspiration contains little of any thing, except a very small portion of salt.

We cannot reasonably doubt that the greater part of the matter of perspiration is water ; but it certainly contains other matters, of which the nature is not well ascertained. Its sensible properties are often very perceptible : it causes the peculiar odour of the body, which is very remarkable in particular individuals, and possesses peculiar characters in whole races of mankind. Its smell is often four ; and it is said, under such circumstances, to change the vegetable blue colours to red. Berthollet thought he had detected the presence of the phosphoric acid ; he observed that a blue paper, applied to a part labouring under a gouty paroxysm, became red ; but Fourcroy remarks, that if this acid were constantly secreted, it must accumulate on the skin, as it is too fixed to be volatilized with the aqueous vapour of perspiration.

From the strong odour of the perspiration when profuse, and from the tinge which it communicates to linen, there is reason to suppose that it contains a particular animal matter. In the perspiration of the horse, an animal substance of the nature of urea has been detected by Fourcroy and Vauquelin, who have also discovered that the phosphate of lime is left in considerable quantity by the evaporation of the perspired matter on the skin of the same animal. It seems to crystallize on the surface, and forms the branny matter detached by friction of the surface. The above-mentioned chemists observe that the urine of this animal contains no calcareous phosphate.

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Mr. Cruikshank's experiments prove clearly that there is an oily matter secreted by the skin: indeed the familiar appearance of the repulsion of water, so as to cause it to run into globules, sufficiently evinces the fact. Mr. Cruikshank wore the same vest of fleecy hosiery night and day during the hottest part of the summer. At the end of this time he always found an oily substance accumulated in considerable masses on the nap of the inner surface of the vest, in the form of black tears. When rubbed on paper, it makes it transparent, and hardens on it like grease. It burns with a white flame, leaving behind a charry residuum.

Besides the condensable vapour which is exhaled from the skin, it has been asserted that gaseous fluids are also separated. Many philosophers have laboured on this subject, but the results of their experiments are so contradictory, that we cannot deduce from them any very satisfactory conclusion.

The count De Milly seems to have been the first who called the attention of philosophers to this subject. He had often remarked the accumulation of small air-bubbles on the surface of his body, when immersed in the warm bath. At length, by means of a funnel and inverted glass jar he collected, in a few hours, half a French pint of the gas, which was examined by Lavoisier. It was incapable of supporting combustion, produced a precipitation in lime water, and suffered no change from the admixture of nitrous gas. Acad. Roy. des Sciences de Berlin, 1777.

Mr. Cruikshank found that a lighted taper, introduced into a bottle in which his hand or foot had been confined for some time, burned dimly; and lime water agitated in it was rendered turbid.

Ingenhouz could not procure the air from the skin in the warm bath in such quantity as the Count de Milly did. What he collected seemed to be azotic gas. *Expériences sur les Vegetaux*, t. 1.

Priestley denies that any gas is perspired by the skin. He repeated the experiments of Ingenhouz, and never could observe the appearance of gas arising from the body when he employed boiled rain water, from which the air had been completely expelled, and detached the adhering bubbles from his arm. He observes that the air obtained by Ingenhouz "was just that mixture of fixed air and partially phlogisticated air, that pump-water, which he recommends for the purpose, generally abounds with." *Experiments and Observations*, vol. v. p. 103.

Fontana arrived at the same conclusion from his researches.

Such also was the result of Mr Jurine's experience, who, after remaining in the bath at different temperatures from 18° to 30° of Reaumur for hours together, never could procure a single bubble of air from his skin. He obtained the same result from observations on several individuals in water of various temperatures. *Histoire de la Société Royale de Médecine*, tom. 10.

Mr. Cruikshank's experiments seemed to prove that air, which has been confined for some time in contact with the skin, becomes changed; though Dr. Priestley maintained that the perspirable matter has no such effect on the air, but leaves it as wholesome as ever.

A very extensive set of experiments performed by Mr. Jurine, of Geneva, and published in the volume already quoted of the *Memoirs of the Royal Society of Medicine*, seems to confirm the observation of Mr. Cruikshank. Although Mr. Jurine could not collect any air from his skin, when immersed in the warm bath, he always found the air

confined about the skin much vitiated. He fixed well-dried bottles under his arm-pits, and round his waist, and having left them there for an hour, accurately corked and removed them, that the contained air might be examined by the usual tests. In these experiments he always employed the mercurial trough. This air was found, on different occasions, to contain .7, .7½, .6, .4½ of carbonic acid gas. He next inclosed his arm in a glass cylinder containing 685 cubic inches of air. One extremity of this vessel closely embraced his arm, round which it was cemented. To the other extremity was fixed a bent tube, which, during the experiment, was plunged under water in the pneumatic trough. After two hours, the air of the cylinder was found to contain .8 of carbonic acid gas. In another experiment the same quantity was obtained after one hour; but the proportion of carbonic acid gas was not greater at the end of two, three, or four hours. Being thus satisfied that carbonic acid gas is formed by the skin when in contact with the air of the atmosphere; he concluded, that he should find the same gas under the bed clothes which confine the air round the body during sleep; and in experiments on different individuals he found that this air contained .4, .6, .7, .8 of carbonic acid gas.

In the same volume are some experiments by Gattoni, which do not lead to the same conclusions with those of Jurine: but they do not seem to have been very accurately performed, and the test of lime water was not employed.

We come in the next place to the researches of Mr. Abernethy. From the hand, introduced into a glass jar filled with mercury and inverted, he collected, in the space of sixteen hours, one half-ounce measure of air, which had escaped in small bubbles from every point of the surface of the immersed hand. Two-thirds of this gas were absorbed by lime water; and the remainder suffered no diminution from the admixture of nitrous gas. When the experiment was repeated under water, a small quantity of azotic gas only was obtained, the carbonic acid having been, in the opinion of Mr. Abernethy, absorbed by the water. The hand was exposed five hours, in a jar containing seven ounces of atmospheric air, which was diminished about half an ounce. One ounce of the remainder was absorbed by lime water, with precipitation of the lime. By the test of nitrous gas the air was found to contain nearly ½th less of oxygenous gas than it did before the experiment. When a similar experiment was performed with seven ounces of azotic gas, rather more than one ounce measure of carbonic acid gas was produced in two hours. The trials were repeated with hydrogenous, nitrous, and oxygenous gases, and in every instance nearly the same quantity of carbonic acid gas was obtained.

In the 45th vol. of the *Annales de Chimie*, there is a short paper by Dr. Troufflet, who had noticed, like Milly, the appearance of bubbles on the skin in the warm bath. He seems to have seen this only in two individuals, and found the air to be perfectly pure nitrogen. In his own person, and in many others, he could observe nothing of the kind.

Spallanzani is the last experimental philosopher who has paid particular attention to this subject. The detail of his experiments has not been published, but the results are preserved in a letter to Senebier, introductory to the *Memoirs on Respiration*. He appears to have been completely satisfied that air in contact with the skin is changed exactly in the same manner as by respiration. When atmospheric air was employed, oxygen disappeared, and carbonic acid gas was produced: he was of opinion, that the oxygen of the

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the atmosphere had no share in the production of the carbonic acid gas, because it was equally great when the animal was confined in gases containing no oxygen; and he therefore concludes, that the carbonic acid gas was exhaled, and the oxygen absorbed.

On a review of these very contradictory evidences we do not seem to be warranted in believing that any gas is separated from the skin: but perhaps we may conclude that the air in contact with the organ undergoes a peculiar modification.

Sebaceous Glands of the Skin.—This organ is habitually covered with an oily substance, which occasions water to run into globules on the surface of the body, which imparts a greasy stain to linen, when it is worn for a long time, and which occasions dust, &c. to adhere to the skin. This unctuous substance is more abundant in some parts of the body than in others. About the face it is observed in considerable quantities, and on the hairy scalp. Hence, when personal cleanliness is not sufficiently attended to, the hair becomes quite greasy and shining. It is abundant in situations exposed to friction, as the axillæ, perinæum, &c.; and when confined in such parts causes a very disagreeable odour. It is found in very small quantity, so that it can hardly be observed, in the palms and soles. Certain races of mankind, as the negroes, have it in great abundance. Probably the sensible qualities of the cutaneous discharge depend in great measure on this matter, the particular nature of which is but little understood. It does not seem to undergo those changes of augmentation and diminution which are observable in the perspiration. Its obvious utility seems to be that of protecting the skin from the agency of external causes, and keeping it in a state of softness.

Is this matter simply an exhalation from the cutaneous vessels, or is it produced by glandular apparatus? In some parts of the skin, as about the nose, and in other situations of the face, the external ear, &c. there are very manifest small roundish bodies, with a simple aperture, from which a sebaceous matter may be sometimes expressed like a fine thread. Morgagni also admits their existence in the neck, back, perinæum, buttocks, &c. Haller does not conceive that they are proved to exist in all parts, and we certainly do not find them: yet this oily matter is formed over the whole body. The examples of the fat of the cellular interstices and of the medullary fluid of bones shew us that the exhalants can produce matters of this kind.

Properties of the Dermoid System.

1. *Properties resulting from Organization.*—These are found to exist in the skin in a very striking degree: the changes of size, in which different parts, particularly the limbs, swell to twice or three times their natural bulk, and then recover their former state, prove these properties; and the various tumours, external aneurisms, sudden distensions from great bruises, collections of fluid in the abdomen, pregnancy, enlargements of the testicle, &c. afford additional proofs. In all these cases the skin is first expanded, and then is restored when the distending cause ceases to act. A square inch of integument has been found able to sustain a weight of 200lb.

The contractility of the skin occasions the retraction of its edges when it is cut; and this occurs in the dead subject; but it seems to be heightened by the vital powers as it occurs to a much greater degree during life.

The extensibility of the skin is less in many cases than it would appear to be on first sight, as the neighbouring integuments are drawn over a tumour. Thus in large swell-

ings in the scrotum, the skin of the penis covers part of the tumour, &c.: in extensive cicatrices the skin of the surrounding parts is drawn towards the centre of the ulcer.

In most extensions the thickness of the dermoid tissue is diminished. When it is distended by the infiltration of water in its interstices, as in anasarca, its thickness increases, while the density is diminished. It seems to lose the power of extension, so as to burst under the action of a distending cause, from chronic inflammation. Most of the chronic affections, which alter the tissue of this organ, destroy its contractile power.

Vital Properties.

2. *Properties of the Animal Life.*—Animal sensibility exists in this organ in a very high degree: it presides over the general sense of feeling, which is more acute in this than in other tissues, and also that of touch, which is very distinct from the former. The general sense, called by the French *taët*, is the power of perceiving the impressions of surrounding objects: in this signification it seems to mean the same as the English word feeling, which is the office of a nerve in general; as those organs only are so affected by external bodies as to produce some change by which the mind is rendered conscious that the bodily organ has been modified. Thus heat and cold, roughness and smoothness, hardness and softness, moisture and dryness; pressure causing pain; acrid qualities; titillation producing itching, &c. are all perceived by the nerves. This kind of *taët* belongs to the whole body; and does not suppose any peculiar arrangement of the organ; it is merely the animal sensibility considered in a state of exercise. Thus, when the particular modifications of this sensibility belonging to the other senses have been destroyed; when the eye is insensible to light, the ear to sounds, &c. the organs still retain the power of perceiving the presence of bodies and their general attributes.

The sense of touch is the power belonging to the skin alone, of examining more minutely and accurately those properties of bodies, which we have just named. For this purpose we employ chiefly the ends of the fingers; those of the toes seem to be organized exactly in the same way, but are incapable of being turned to this use by the hardness of their coverings. These parts are conspicuous for the size of their nerves, and for the number and prominence of the papillæ. This organization gives to them a more exquisite sensibility of the same kind with that belonging to the skin in general. The form of the organ in the human subject, where it is composed of several moveable parts, adapts it particularly to serve as an instrument of touch, by facilitating its application to external objects; and this advantage may be more particularly seen in bodies of a rounded figure. We rub the fingers gently against the object, so as to apply the papillæ successively to the different points of its surface. Whether any physical change takes place in the organ, whether the papillæ for example are erected or no, is entirely unknown.

The distinction of colours by blind persons, if such a power has really existed in any instances, must have arisen from modifications in the surface produced by the colouring matter. We know that the touch in all cases of blindness acquires great acuteness, as it must be so much more exercised and depended on, than in individuals who can see.

The temperature of bodies is estimated by a comparison; those are called cold, which are of a lower temperature than what we had felt immediately before; and *vice versa*. Or we refer to the state of our own surface, and call the objects, from which heat passes to us, warm, and those of the opposite kind cold. The same fluid will appear cold to one hand

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and warm to the other, if we have previously immersed one in a warmer, and the other in a colder medium.

It has been conceived that the sense of touch is of great use to us in correcting the errors of the other senses, and particularly of the sight. This peculiarity belongs to it certainly, that the organ is modified by the very body whose properties we are examining; while, in the case of vision for example, the eye is affected not by the object itself, but by the rays of light. Perhaps we are less deceived by the other senses, and by that of sight itself, than has been commonly imagined. Without any assistance from the sense of touch, for which his organization entirely disqualifies him, the horse measures the hedge or ditch with his eye most accurately, and clears the distance with great exactness. Newly born animals seem to commit no errors in seeking their food or their parents, &c. On the other hand, the touch is not free from error. The experiment of rolling a round body under two fingers decussated, which give us the sensation of two bodies, shews this. Moreover, the touch no more informs us of the real nature of things, than any other sense; we acquire a knowledge of their properties through certain interposed media, and alterations in them very much modify the perception. When the epidermis is removed, external bodies cause pain, and do not excite the impressions, which inform us of tangible properties; again, when the cuticle is preternaturally thick, as in the hands of labouring men, no sensation takes place.

This sense is also subject to various morbid conditions. In hypochondriacs there is sometimes a feeling as of cold air; and the slightest contact of air is intolerable. Ann of Austria found the finest linen manufactures unpleasantly rough; and some have not been able to endure the touch of silk, or of the down of a peach.

Habit, too, has a powerful influence in modifying the impressions which we receive from the touch. The heat of a glass-house, which is sustained without any unpleasant feeling by the workmen for several hours, is intolerable to a person unaccustomed to it.

The touch differs from the other senses in not requiring a peculiar mode of sensibility for its exercise; the hand is rather more sensible than the rest of the skin, but we can touch with other parts of our surface. In the other senses there are peculiar kinds of sensibility disposing the organs to be acted on by particular objects, and rendering them unsuspceptible of other impressions. The exercise of the touch is determined by volition, and is generally consequent on the employment of the other senses.

Most of the other senses require an express organic arrangement, as well as a peculiar sensibility in the organ; the touch, on the contrary, requires only a particular form in its organs. If they have the animal sensibility, and can embrace objects by several points, they can distinguish the tangible properties. The touch will be imperfect, if the organ is in contact with the body only in one or two points; yet it will take place. Thus we can touch with the hollow of the axilla, at the bend of the elbow, or the knee. But the sense is exerted more advantageously when the points of contact are multiplied. The structure of the human hand is particularly well contrived in this point of view; it shews us that man is calculated, much more than the animals, for communication with surrounding objects; that the domain of his animal life is therefore much more extensive; that his sensations are more precise, as they possess an additional means of perfection; that his intellectual faculties are capable of filling an infinitely greater sphere, because they are grounded on the exertion of a much more perfect organ.

The sensibility of the skin seems to reside essentially in the papillæ, which is the part of the integuments truly belonging to the animal life, as the vascular plexus, composing the reticular body, is connected with the organic functions. Its very acute sensibility requires a protection from too strong impressions; and this is afforded by the epidermis. When that is removed, even the impression of the air is painful, and causes a sensation, which we call smarting, which belongs perhaps exclusively to the dermoid system. It is felt in burns, blisters, erysipelas, and in all the inflammations affecting the reticular body of the skin. Itching is another mode of sensation peculiar to this system.

Besides the impressions, which teach us the properties of bodies, the exercise of this organ produces feelings of pleasure and pain. So far as the sense of touch is concerned, pleasure may be considered as that condition of the body, which we should wish to have continued. The more exquisite feelings of this kind are produced by friction of the papillæ. Without referring to venereal sensations, we may mention a practice of the Chinese, of introducing a small pencil into the ear and moving it round so as to excite a very acute pleasurable feeling. Tickling must be something of this kind; it is peculiar to the skin, and in many individuals excites sensations which are almost intolerable. Great differences in this respect are observed in different persons. Pain is the very reverse of pleasure; and, in the skin, is the most acute, when the naked organ, where it possesses many papillæ, is irritated.

The animal sensibility of the skin, like that of the mucous surfaces, is under the powerful influence of habit, which transforms successively into indifference, and into pleasure what was at first painful. The air in the succession of the seasons, heat in the various states of the atmosphere, water in the bath, or in the humid vapours with which it loads the medium in which we live, our clothes, of which the woollen are at first very unpleasant, in short, every thing which acts on the skin by simple contact, produces sensations which are incessantly modified by habit. Observe the varieties of dress in different countries; sometimes the upper limbs are uncovered, sometimes the lower; in some instances more or less of the trunk is exposed to the air; often the savage is entirely naked. The parts which are left naked in each people, support the contact of the air without any painful sensation. Expose, on the contrary, the parts which are habitually covered, particularly if the atmosphere be cool, a painful sensation will be produced at first, but, as the parts become gradually habituated to the contact, they are at last insensible to it.

But habit has no power over that heightened state of the cutaneous sensibility, which results from an organic affection, as inflammation for example. The slightest contact of a foreign body is extremely painful in this case; and consequently the skin can no longer exert its function of touch. Even the tact, or the power of distinguishing general sensations, is destroyed. The impression of all bodies is uniform; it is that of pain.

The animal sensibility of the skin may be diminished or destroyed, as in paralysis; but the whole organ is never affected; and in this respect there is very seldom even hemiplegia. These cases afford a further proof that the cutaneous exhalation and capillary circulation are not influenced by the nerves, since both go on very well as they do in the paralysis of the moving organs.

Properties of the Organic Life.—The organic sensibility and the insensible contractility exist in the skin in a very high degree, and reside particularly in the exterior capillary system, which

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forms the reticular body. On these properties depend immediately, 1, the capillary circulation; 2, the cutaneous exhalation; 3, the absorption; 4, the nutrition of the dermoid system; and 5, the secretion of the cutaneous oil, where sebaceous glands exist. Besides these numerous functions, we must reflect that the skin is constantly exposed to the action of external causes, which keep it in a state of habitual excitation, as the contents of mucous surfaces act on those surfaces.

The skin does not seem to possess the sensible organic contractility; irritating applications act only on the capillaries, and therefore produce an effect, which is not obvious to the eye. Yet the corrugation of the integuments under the strong action of cold, resembles in some respects the sensible organic contractility; this, which takes place in the corion, seems to hold the middle between the two kinds of organic contractility.

Passive Sympathies.—The animal sensibility is often brought into action sympathetically in the skin, by the affections of other systems. There are various examples of itching, &c. without any derangement of the part, to which the sensation is referred.

Very often the feeling of heat or cold occurs in the skin, when there is no cause affecting the organ to produce such sensations; there seems to be an erroneous reference of the unpleasant feeling to its source as in the case of pains felt in amputated limbs. The shiverings which occur at the commencement of most acute local diseases are of this kind: there is often a sudden and sympathetic sensation of cold on the skin at the moment of the expulsion of the semen; the shivering of fear, and the sweat which often accompanies it, seem to be of the same nature. A species of sympathetic cold is also often referred to the skin at the commencement of digestion.

The feeling of heat often occurs sympathetically in the skin. The flushings, which occur so often and irregularly in different fevers, are well known, and are not attended with any disengagement of caloric. These feelings of heat and cold are produced without any alteration of temperature, as sympathetic pains occur without the action of those obvious causes, which give rise to them under other circumstances. In fact, the sympathies of the animal sensibility call into action, in each system, the feeling which is habitual to it. The same cause which produces the sensation of heat or cold in the skin, would have given rise to that of lassitude in the muscles, &c.

The organic properties of the skin are frequently called into action by sympathies: thus cold drinks suppress perspiration. Augmented cutaneous exhalation follows almost immediately the introduction of warm fluids into the stomach. The sweat of fear and that of consumption are of the same nature. Diseases exhibit to us innumerable varieties of dryness and moisture of the organ, phenomena which are generally sympathetic.

Active Sympathies.—The irritation of the skin in tickling, in very sensible individuals, excites various organs sympathetically; as the heart, producing fainting; the stomach, vomiting; and the brain, convulsions. Affections of the cutaneous exhalants, or of the capillary system, from which they arise, act sympathetically on various organs. Thus the warm bath disturbs the process of digestion; while its influence in many cases allays disorders of the stomach. The action of cold on the surface, particularly during sweating, produces several sympathetic effects. We express what occurs very inaccurately, when we refer it to the translation or repulsion of the perspiratory matter. The organic sensibility

of the pleura is sympathetically affected by the application of cold to the skin; just as an uterine or nasal hemorrhage may be stopped. The suppression of transpiration is an accessory circumstance completely foreign to the internal inflammation. If there were no perspiration at the time that the cold is applied, the inflammation would still come on.

The shaking of the muscles, and the concentration of the pulse, produced by the weakened action of the heart, are phenomena caused entirely by the action of cold on the skin.

The numerous phenomena occasioned by the sudden disappearance of cutaneous eruptions should be referred to modifications of the vital properties of the organs, and not to any morbid matter repelled from the skin.

The serous surfaces and the cellular substance on one side, and the skin on the other, are often in opposition in diseases. Patients never sweat during the formation of dropsies; and this dryness of the skin is often more remarkable than the small quantity of urine.

Characters of the vital Properties.—1. They vary in the different regions of the body. The palms and soles are the most distinguished for their animal sensibility: the hypochondria are so sensible in some individuals, that tickling will produce convulsions: the anterior and lateral parts of the trunk are more sensible than the back. The organic properties do not differ less; of which the great susceptibility of the face to the influx of blood is a proof. Particular parts are subject to particular cutaneous diseases, &c.

2. Intermission of action in one respect, uninterrupted continuance in another. The former character belongs to this system, as to all the senses, in its animal sensibility. Immediately before sleep comes on, external objects produce but an obscure sensation, which is entirely lost in that state, in which animals seem to part with half their existence. Yet the touch seems to be exerted occasionally while the other senses are in repose: pinch the limb of a person sleeping, and he will move it without waking, or retaining any recollection of the occurrence. In its organic sensibility the life of the cutaneous system is uninterrupted; consequently the functions, over which this property presides, have an opposite character to the preceding. The insensible transpiration goes on continually, although it is more active at some times than at others.

3. Influence of sex. The animal sensibility is more acute in women, in whom every thing belonging to the senses is more developed, while the power of the muscles predominates in man. No very sensible difference can be remarked in the organic properties.

4. Influence of temperament. The colour and other sensible properties of the skin vary in individuals, and these variations even constitute characters of the different temperaments. When we see these differences of organization, can we be surprised at finding that the sense of touch is acute in some, dull in others; that some persons are very susceptible of tickling, and others almost insensible to it? That the organic sensibility admits a great quantity of blood into the capillaries of the face in some, and rejects it in others; that some have a moist and others a dry skin; that there are dispositions in individuals to particular cutaneous affections, chronic or acute? &c. &c.

Development of the dermoid System.—The skin, in the early times of conception, appears as a viscid coating, which is gradually condensed into a transparent layer, torn by the slightest violence, and allowing the subjacent organs, particularly,

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ticularly the blood-vessels, to be easily seen through it. Its consistence increases until it acquires the appearance exhibited at the time of birth. In its mucous state cellular substance and vessels compose it entirely: when the fibres of the corion are added, it becomes firmer. The external surface exhibits but few of the wrinkles described above: they are prevented from appearing by the large quantity of subjacent fat. The inner surface adheres but slightly to the cellular layer under it. It contains more blood than at any other period of life. The animal sensibility is not yet called into exercise; there are no causes to excite it. Is the organic sensibility in action at this time? It must be so in a certain degree to produce the unctuous secretion, by which the surface is covered.

This system undergoes a sudden revolution at the instant of birth. Hitherto it has received only black blood, and is consequently more or less livid at birth. This colour gives place to red, produced by the arterial blood now first formed: and the state of the skin in this respect may be considered as an index of what is passing in the lungs. All parts of the organ are penetrated uniformly by the red colour. A sudden excitation is thus communicated to the organ, exalting its vital properties, and rendering it more susceptible of the impressions of surrounding objects. The surrounding temperature, the air, clothes, the water used in washing it, communicate to the skin an excitation, which is the more sensible in proportion to its novelty. The sympathies connecting the skin to the other organs now become necessary: thus the internal organs quickly feel the excitations applied externally.

The organic sensibility is augmented at the same time; transpiration is established; various substances are separated by it; others perhaps absorbed; and various diseased affections shew themselves.

The organ still continues soft for some time after birth; and melts entirely into jelly very easily by ebullition. Its density increases gradually, but has not arrived at its greatest state till towards the thirtieth year. As this augmentation proceeds, the fibrous substance is increased in proportion to the gelatinous. At the same time the adhesion of the internal surface to the cellular substance becomes stronger, and the wrinkles of the face are gradually formed. No remarkable change is produced in this organ at puberty: sweats are more abundant after this time; in children the residue of nutrition passes off by the kidneys rather than by the skin.

The organ still retains a great activity after the age of growth, and very easily influences other parts of the frame: hence the peripneumonies, pleuritis, &c. produced by the action of cold.

The increase of the fibrous substance renders it more firm: less blood seems to be sent into its vessels, and it is less subject to those eruptions so common in infancy and youth.

In declining age the dermoid system becomes more and more dense: it resists ebullition for a long time, but yields a firmer and more consistent, though less abundant jelly. It is stronger but less pliant. The blood penetrates it in smaller and smaller quantity: the redness of the cheeks disappears. The adhesion to the cellular substance is much more close. All the wrinkles are more strongly marked, and several are now perceptible for the first time.

The vital powers of the skin are more weakened than those of other systems in the old man, because it has been more excited by external objects during life: the habit of feeling has blunted its sensibility. The touch is now exer-

cised but rarely; as this sense is employed in a great measure in subservience to those of sight, hearing, &c. to rectify or confirm our other sensations, the old man, being acquainted with what surrounds him, has no motive for the use of his organ of touch. Contrast, in this point of view, the two extremes of life. The infant, to whom every impression on the sight, hearing, &c. is new, wishes to touch, to seize every thing: his hands are in constant motion. Touching is a great pleasure to him, because all new sensations are agreeable. If an old man were placed in the midst of objects, which had never before impressed his senses, he would exercise his touch more frequently; but, among the things to which he is habituated, there is nothing to excite him. Hence old age is no longer the time of enjoyment. Almost all our pleasures are relative; as habit renders these less lively, they cease in consequence of having existed; thus the advance of years, by leaving us few new sensations, diminishes the sources of our happiness. For the contrary reason the happiest age is that of infancy; because the whole domain of sensation lies before us unexplored; at every step of his advancement man leaves behind him a source of enjoyment. His career ends in indifference, a state very suitable to that period, as it diminishes the interval between life and death.

The following phenomena shew that the organic, as well as the animal sensibility, is remarkably diminished in the old man. Contagions are less easily absorbed. The sweat is less abundant, and hardly ever exhibits those augmentations which are so frequent in the adult. The greasy covering is less copious, and hence the surface is drier. The various morbid affections, such as erysipelas, and the various eruptions, are less common and much slower. The power of resisting cold is sensibly diminished.

Epidermoid or cuticular System.—The slightest examination is sufficient to shew very striking differences between this and the preceding system, although physiologists have generally described this merely as a dependance of the former. The organization, properties, functions, mode of growth, in short, every circumstance is different in the two cases.

Under this head we consider the exterior epidermis; that which covers a part of the mucous system; and the nails. Many characters approximate the latter to the epidermis, although the external appearance is very different.

The *exterior epidermis* is a transparent layer, differing in thickness in different parts, every where covering the skin, and immediately exposed to the excitation of external bodies.

It has the same inequalities as the cutis, since they are every where exactly contiguous. Various pores penetrate it, and terminate on its surface: the more conspicuous ones transmit the hairs; others give passage to exhalants. The latter are not easily seen; but if, when the skin is dry, we suddenly begin to sweat, we can distinguish them by the small points of moisture then exhibited over the whole cutaneous surface. We cannot actually see the pores in the dead cuticle, even with the assistance of the microscope; and the fluid under a blister does not escape through them; but the phenomena exhibited during life leave no doubt of their existence. The internal surface adheres most closely to the outer surface of the cutis. We conceive the union to be by means of the exhaling and absorbing vessels and the hairs. Dr. Hunter thought that the vessels could be demonstrated. On separating the cuticle after long maceration, particularly in the sole of the foot, a vast number of extremely fine and soft threads are seen passing between it and the cutis: they break after being extended to about one-

one-eighth of an inch. These may be vessels; but it is only a conjecture. On examining the surface of the separated cuticle, numerous prolongations of various lengths are observed, appearing like small ends of fine threads, or as mere inequalities, and disposed obliquely. These may be absorbents and exhalants. Whatever the medium of connection may be, the adhesion of the parts to each other is very strong.

Various causes destroy this adhesion of the epidermis, and occasion its separation. Acute inflammations, as erysipelas, phlegmon, &c. are followed by its detachment; and various eruptions, not of an inflammatory nature, cause its detachment in a dry scaly form; which has given rise to the notion that it is made up of scales in its natural state. When the skin is unequal on the surface, friction detaches it in small scales, which give a very rough appearance to the part. Fevers are not unfrequently followed by desquamation of skin. The action of vesicatories is familiarly known. In the dead subject, putrefaction, maceration, and ebullition are the most effectual means of accomplishing the separation.

The thickness of the epidermis is in general very uniform: it does not seem to follow those varieties which we observe in the cutis of the trunk, limbs, &c. It is only in the palms and soles, and on the corresponding surfaces of the fingers and toes, that its thickness is increased: and here the augmentation is so considerable, that there is no proportion between these and other parts of the body.

There seem to be in this part several additional laminae; and the inner surface, after separation, does not exhibit those processes already spoken of. This excessive thickness prevents the action of blisters. In repeated trials Bichat found that they produced no effect. The transparency of the epidermis is destroyed by this thickness: it is here whitish, and even opaque. Hence, in the negro, it conceals the black colour of the reticular body; which, however, is, at the same time, less black here than in other parts. The epidermis in these situations is manifestly composed of successive laminae, adhering with such force, as to be very difficultly separated: in all other parts we can discern only a simple layer. No fluid can be noticed in this tissue: when cut in various directions, either in the living or dead subject, nothing exudes. Its scales are always perfectly dry: the absorbents and exhalants merely traverse it. No blood in the living state, nor injection after death, enter it in any case. It never participates in the diseases of the subjacent organ, except by being elevated when that is swollen, and then detached. Nerves and cellular tissue are completely foreign to it. Thus we see that none of the general systems, common to all organs, enter into the composition of the epidermis: it has not the common basis of all organized parts; and in this point of view may be regarded as inorganic. It seems to contain no fibre in its composition: it possesses very little power of resistance, breaking under a slight distention, except in the soles and palms, &c. where it is so thick.

The action of air produces hardly any effect on it. When a large piece is exposed, it becomes rather harder, and more consistent, and is torn more difficultly. Next to the hair and nails, it is the tissue least changed by desiccation. It is rendered a little more transparent, but immersion in water restores it to its former state. When the skin passes into a state of putrefaction, the cuticle is not at all changed. It is separated from the cutis, but not rendered at all putrid; if it be thoroughly washed, it has no bad odour. When preserved in moist air, it is not changed; and it may be regarded as the most incorruptible of animal substances, after the hair and nails.

Moisture applied for a long time whitens the living cuti-

cle, and throws it into numerous wrinkles. This effect is observed in the application of poultices, and seems to arise from the tissue becoming penetrated with the fluid; it takes place to the greatest degree in the foot and hand, and often is hardly sensible in other parts. The sensibility of the skin is rendered more obtuse by this change in the cuticle. The water imbibed by the part is afterwards evaporated, the wrinkles disappear, and the cuticle recovers its former state. When separated from the body, and immersed in water, it is whitened: it undergoes no putrid alteration, but is covered by a whitish pellicle formed of separate molecules. At the end of two or three months it is softened, and may be torn very easily, but does not swell: it is never reduced to a pulp analogous to that of other organs when macerated. Boiling never produces crispation or corrugation of this tissue: prolonged ebullition renders it less resistant, so that it may be torn very easily, but never reduces it to gelatine, nor gives it a yellow colour. The laminae which compose it in the hands and feet are easily separated after long boiling. The tanning principle has no action on it; nor has alcohol.

When well dried in the air, and exposed to the flame of a candle, it undergoes no crispation, as a piece of skin does when treated in the same way: it exhales a fetid odour analogous to that of burnt horn. It burns with great facility, so that if it be lighted at one end, it will often be entirely consumed. A blackish fluid is observed in the flame, like that of burnt feathers. This is clearly of an oily nature, keeps up the combustion by its great abundance, and is found in so large a quantity only in the hair and nails: this produces a disagreeable odour. A blackish coal remains after combustion. Light does not seem to affect the epidermis, which is not changed when exposure to the sun has altered the appearance of the skin.

Nitric acid turns it yellow, but dissolves it with great difficulty. Sulphuric, on the contrary, when not much diluted, acts very powerfully on it, rendering it very thin and transparent, or dissolving it entirely by long immersion. Alkaline solutions dissolve it, but with difficulty: pure alkali acts on it rapidly; as also does lime, according to Chaptal.

It, says Dr. Thomson, the cuticle be tinged with nitric acid, the application of ammonia to it is well known to give it instantaneously a deep orange colour. Now, as Hatchett has shewn that this change is also produced upon coagulated albumen in the same circumstances, and as the epidermis resembles that substance in all the properties above detailed, it can scarcely be doubted that it is any thing else than a peculiar modification of coagulated albumen. *Syst. of Chemistry*, v. 5, p. 574.

Properties.—It has very little extensibility, as the smallest cutaneous tumour causes it to crack, and be detached in scales. Yet it is not entirely destitute of this property, as its elevation in blisters proves. It has no contractility: when no longer distended, the portion elevated in a blister collapses in wrinkles, and does not regain its original size. It has no animal sensibility in any part: it may be pricked, cut, torn, or injured in all parts without exciting any sensation. It differs from other organs, as cartilages, tendons, &c. which also have no animal sensibility, in being altogether unsusceptible of that property, which they often acquire under certain kinds of excitement. The epidermis is equally destitute of the organic sensibility, and organic insensible contractility: it possesses no circulation, and is susceptible of no diseases, which depend on the organic properties. We have no proof, in short, that it enjoys any vital powers at all; so that we may consider the whole superficies of the body as composed of dead matter. "Its life," says Bichat, "is extremely obscure;

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feure; I even doubt whether it can be said to possess life. I am inclined to regard it as a semi-organized, or rather inorganic body, placed by nature at the point of communication between external dead matter and the living skin, and serving as a gradation between them.'

The action of external bodies wears it away, and it is constantly reproduced. Scrape the surface with the blade of a knife, and an abundant greyish dust will be detached. This matter accumulates in greater quantity, when the skin is not frequently washed; under such circumstances there is often a considerable layer.

It is reproduced very completely after being removed; and differs in that circumstance from most other tissues. How this is effected has been a point greatly disputed by physiologists; but the explanations have been entirely mechanical and unsatisfactory. That it is deposited by the vessels of the skin cannot be doubted; and we shall probably understand how the process is effected, when we understand how the vessels make bone, muscle, nerve, &c. This reproduction only takes place on the skin: the thin pellicle covering the cicatrices of other tissues has a completely different texture. The different excrescences affecting the cuticle, as corns, &c. result from the exercise of this reproductive power. They are all insensible, have no vessels nor nerves, and possess the same consistence and colour as the epidermis. External pressure seems to promote their formation very powerfully; tight shoes produce corns; and much handling of heavy instruments in hard work produces the thick cuticular covering of the hand in blacksmiths and other mechanics.

The cuticle of the palms and soles is however originally thicker than that of other parts; this may be seen in the fœtus.

In the dead body the cuticle has a remarkable effect in preventing the evaporation of the fluids; none of which are dissipated so long as this covering remains entire. If the body be exposed in a high temperature, as of 100° or 120°, it does not seem to become dried; and where the limbs are distended in anasarca, if it has not cracked, none of the fluid escapes. Remove the cuticle, and the cutis quickly becomes dry, transparent, and horny, and the subjacent parts are subsequently affected in the same way.

The epidermis is seen very clearly in the fœtus, where its development is greater in proportion than that of other systems. It may be recognized when the skin leaves that pulpy state which we have spoken of. At the end of the fifth month it is thicker in the palms and soles than in other parts. It appears to undergo no change at birth; but grows rather thicker afterwards as age advances. In the old subject it differs from that of the adult only in being subject to scale and crack, and thereby appearing dry and rough.

Internal Epidermis.—Most authors have admitted an epidermis on the mucous surfaces; and they have generally represented that this is the only part of the integuments that lines the mucous cavities. But a little examination will shew us that this expansion forms only a superficial stratum, and that if it be detached by hot water from the tongue, palate, &c. an organ analogous to the corion is left behind.

1. *Epidermis at the Origin of the mucous Surfaces.*—It is very distinct at all the origins of the mucous system, at the glans, urethra, anus, nasal cavities, mouth, &c. It may be demonstrated in these situations by the excoriations which sometimes affect them, by detaching it with a fine lancet, by the action of hot water, by maceration, &c. It is much more delicate in these situations than where it covers skin, and becomes more and more so as it penetrates deeper. In these parts it

is easily reproduced. It is destitute, like the exterior epidermis, of vital properties; and its nature seems to be in all respects the same; it yields the same results, when exposed to the same agents.

2. *Epidermis of the more deeply seated mucous Surfaces.*—As we advance further into these organs, the epidermis becomes gradually thinner, and soon is no longer perceptible. The most delicate instruments and methods do not enable us to demonstrate it in the stomach, intestines, urinary and gall-bladders, vesiculæ seminales, and the various excretory passages. No epidermis is elevated on the surface of these organs by boiling or maceration; nor by blisters: nor is there any thing like a separation of such a covering in any diseases. We shall be disposed to conclude, from these considerations, that there is no cuticle on the deeply seated mucous surfaces, and that the large quantity of mucous fluids poured out in these situations supplies its place by protecting the corion from the impressions of noxious matters. The only circumstance that could induce us to hesitate, is the occasional separation of substances like membranes, which might be regarded as exfoliations of an epidermis. Numerous examples occur in medical writers of such matters being voided from the bladder, stomach, and intestines. On this subject we possess no very precise data.

The Nails.—We connect the history of these organs with that of the epidermis, as they adhere to it very strongly, and come away with it in maceration. Their form in the human subject differs very much from that which they have in animals: they are generally thick and conical in the latter, thin and flattened in the former. They consist of hard, transparent, and elastic plates, of a substance resembling that of the horns of animals, covering the extremities of the fingers and toes on the aspect of extension. Thus they are not adapted to purposes of offence, but are better suited to the support of the broad ends of these members, which confer on the human subject a more perfect power of touch. Their length is limited by the universal practice of cutting them to a level with the end of the finger or toe: if left to themselves, they are prolonged, and at the same time bent so as to cover the ends of those parts. The natural limit of their growth seems to be that period at which they acquire a sharp cutting edge: for they are then gradually worn away at the margin.

Three parts may be very easily distinguished in the nail: a posterior portion, covered on both sides by integuments: a middle part, which is the most considerable, adhering by its concave, and unattached on its convex surface; and an anterior, free from adhesion in both respects.

The posterior division is about one-sixth of the whole: it ends behind in a very thin serrated edge, by which the nail seems to grow out of the skin. This part is soft and flexible, and of a white colour: it is bounded by a straight line, which, with the two margins, give to the organ a square figure. The convex surface adheres intimately to the epidermis, which covers it in the following manner. The cutis terminates over the root of the nail in a semilunar edge, in front of which is a small cavity adapted to, and filled by, the white part of the nail. Along the concavity of this crescent the cuticle forms a small and distinct fold, which may be cut without any feeling of pain, and which is reproduced. It adheres closely to the root of the nail, and is produced anteriorly for some length on its surface, unless it be cut away. Many describe it as being continued over the whole convex surface. Behind it appears to be lost in the soft and thin posterior margin. Without the adhesion, which connects the semilunar border of skin

to the nail, there would be a species of cul-de-sac between these parts. Some have conceived that the extensor tendon reaches to the posterior edge; but its termination at the tubercle of the last phalanx is very distinct; and there is a space of two or three lines between this and the nail. The concave surface of this posterior division adheres in the same way as that of the middle part.

The convex unconnected surface of the middle division is smooth, whitish behind for a small space terminated by a semicircular edge, and red in the rest of its extent in consequence of the colour of the subjacent parts. On the sides it is covered a little by the skin, which is continuous with the semilunar projection already described. The fold of cuticle is also continued, and adheres to the margin of the nail. The concave surface of this part is laminated longitudinally, and the plates end in very thin and membrane-like edges; but this laminated texture does not extend to the white part. The organization may be well seen in the hoof of an animal, as the horse; where the plates are of considerable breadth and number.

The edge of this concave adhering portion is fixed in front by the epidermis, which, after covering the extremity of the finger, is attached to the surface of the nail at the front end of its laminated portion, in a curved line; here again it seems to be confounded with the substance of the nail.

The loose anterior portion, the length of which is limited by cutting, is manifestly thicker than the middle and posterior parts. Indeed the thickness, hardness, and resistance of the organ increase gradually from behind forwards.

At the attachment of the nail, the skin is marked by a deep parabolical groove, in which the former is received: the fold, which bounds this groove behind, overlaps the white part of the nail, covers a considerable portion of it, and adheres firmly to the posterior thin edge. From this hollow the cutis is produced over the posterior surface of the last phalanx to the end of the finger, between the nail and the bone, and adheres closely to the periosteum. At the sides and in front it is continuous with the common skin. In this situation it has a peculiar organization; it becomes softer and redder, has more numerous vessels, and is distributed in longitudinal laminae, corresponding to, and received between, those of the nail. But the portion of skin corresponding to the white part of the nail, is also different in its colour, and not laminated on its surface. From this part numerous fine and long papillae or villi arise, and are received into corresponding hollows of the nail: the same structure exists more or less over the whole surface covered by the nail. It appears that the organ grows principally from the white part: at least, if a mark be made towards the root, it gradually advances to the loose edge, coming more and more forwards until it entirely disappears. The papillae of this part give to the organ a very exquisite sensibility: hence the acute pain of paronychia, and of that barbarous practice of tearing off the nails.

Organization and Properties of the Nails.—These can be most advantageously observed in the larger ones, as those of the thumb or great toe. A single lamina occupies the whole convex surface; this exists alone at the posterior edge, and hence the thinness of that part. New plates are successively added on the concave surface towards the front, so that the organ becomes successively thicker and thicker: they may be easily removed in separate strata, and are shorter and shorter as they are placed more and more towards the front.

These laminae, composing the nails, seem to be in their nature nearly identical with the epidermis. The most superficial is manifestly continuous with that organ by its edges. The nails may be detached and are regenerated exactly as the cuticle is. Their vitality is as obscure as that of the cuticle: they exhibit no trace of animal sensibility, nor of any organic property. When burnt they cause a disagreeable odour like that of the epidermis, and exhibit altogether the same phenomena. Mr. Hatchett conceives that they consist, like the cuticle, of coagulated albumen. They contain a little phosphate of lime. Maceration and coction do not, however, produce in these organs the same want of consistence or kind of brittleness which they do in the epidermis, on account of their greater solidity. The action of acids presents nearly the same phenomena. Thus, on the whole, the composition, organization, and properties of the nails and epidermis seem to be perfectly analogous: they make up together a perfect insensible covering to the cutis, a structure void of vital properties, and therefore exercising no vital functions. The only differences between them seem to be modifications of form and arrangement arising from the uses of the parts which they cover. Physiologists assign to the nails the office of supporting the soft ends of the fingers by which the sense of touch is exercised, affording to the papillae a point of resistance, and protecting them from external violence. They are also supposed to enable us to grasp objects more firmly, and to take up minute bodies more conveniently.

Development of the Nails.—While the skin is still pulpy in the fœtus, the nails possess considerable firmness, but are very thin. Their length at the time of birth is not proportionate to what they acquire afterwards; they do not exceed, and frequently do not reach the ends of the fingers. At this time their transparency enables us to observe the livid colour of the venous blood circulating before respiration, and to observe how it is succeeded by the redder arterial fluid. After birth they increase as the epidermis does; and they become extremely thick in old persons.

Of the Hair, (Système Pileux of Bichat.)—The human frame possesses much less of this covering than that of animals: the contact of external bodies with the skin being in great measure intercepted in the latter, the animal sensibility of the cutaneous organ must have much fewer external relations in them, and consequently perform a much less important part. In animals the reproductive and digestive functions seem to be the principal sources of pleasure.

1. *Hairs of the Head.*—The system predominates in this part, covering the cranium nearly as the bodies of animals are covered. For this reason, as well as on account of its convex form, which allows it to come in contact with bodies by a small surface only, it is very little capable of acting as an organ of touch. The face is less generally covered, excepting one part in the male sex. This portion of the body, in which most of our means of communication with external objects, as the organs of sight, smell, and taste are assembled, is not favourable in its form to the exercise of touch. The elongated snout of most quadrupeds enables them to touch external objects, to turn and move them in various directions, as well as to seize them for food: in man the former functions are exercised by the hands.

The boundary of the hair towards the front is very variable in different individuals: and these varieties influence the breadth and apparent height of the forehead; the direction of this part is dependent entirely on the bony structure. Hence the hair influences but slightly the expression

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of the figure: we attach the ideas of majesty and grandeur less to the breadth of the forehead, than to its perpendicular direction. The number of the hairs in a given surface is singularly variable: they may be so close as to touch in every point, or may leave intervals in which the skin of the cranium is visible. We hardly know the natural extent of their growth. They will sometimes become so long as to touch the thighs or even legs; and this circumstance, like a crowd of others, tends to prove the destination of the human subject to the erect attitude. It has been questioned whether the practice of cutting them produces any physiological effect; whether the constant growth, rendered necessary by this practice, be performed at the expence of any other parts or functions.

The strength of the hair is very considerable in proportion to its slender bulk: no part in the animal economy, not even the fibrous system, will support such considerable weights. Ropes made of hair would therefore be very useful, if they could be procured of sufficient length.

Smooth and straight hair grows to the greatest length; in proportion as it is curly it is shorter, of which the woolly kind in the negro is a remarkable example. The colour varies in the different races of mankind, and thus becomes a characteristic attribute in the natural history of the species. But it varies no less in the different individuals of the same species; and these varieties follow the same general rule with that which regulates the colour of the skin and eyes. Hence these differences are to be considered in enumerating the characters of the different temperaments.

The eyebrows and eyelashes are described under the article EYE. The hair composing the beard, which we have alluded to in the article GENERATION, as one of the sexual distinctions of the male, is shorter than the covering of the head, and longer than any other hairs in the body: it is always more or less disposed to curl, is stronger and less greasy than the hairs of the head. It generally follows their colour; but very often deviates into the red tint. Its quantity varies singularly in different individuals: common opinion associates the idea of strength to its abundance, particularly if it be black. For some remarks on the effects of cutting it, see HAIR.

2. *Hairs of the Trunk.*—Their quantity is exposed to very great variations; some being almost covered, while others have the surface perfectly smooth. They are much more numerous in front than behind: and in the former situation abound chiefly on the chest, and in the course of the linea alba in men. There are none on the thorax in women, who have altogether but few on the trunk. A considerable collection, resembling the beard in its nature, is found about the generative organs in both sexes. These are very seldom light in colour, frequently approaching to red, and very commonly black. This increase of the hairy system is almost peculiar to the human subject. Its quantity varies very greatly.

3. *Hairs of the Extremities.*—These organs are for the most part covered: the number of their hairs is nearly uniform in most individuals, but the length differs greatly. In the hollow of the axilla, a small collection occurs resembling those of the genital organs: but there is nothing like this in the lower limbs. The inner surface of the arm and forearm has none of this covering in most men: but the lower limbs are more uniformly covered; the back of the foot and hand are constantly covered, but the palms and soles, and corresponding surfaces of the fingers and toes, are always perfectly smooth. The latter circumstance seems to contribute to the perfection of the organ of touch.

On the organization and mode of growth of the hair, the reader is referred to that article.

Properties of the Hair.—It experiences but a slight corrugation from the action of heat, but it is twisted or curled in various directions: moisture makes it straight again. It hardly possesses any extensibility or contractility. Whether they have any vital properties is a subject of dispute: at all events they are exceedingly obscure. We are disposed to deny their existence in this system, as well as in the epidermis and nails. Bichat, who, for some of the reasons explained in the article HAIR, conceives that they are the seat of vital processes, adds, "we cannot however deny, that in the natural state these organs come next to the epidermis and nails in possessing the least active life, and having the fewest relations to other organs. While all other systems are deranged by disease, this is generally unaffected; the hair grows as usual, and seems not to experience the slightest disturbance; its mode of existence is, therefore, quite different from that of other structures."

Mr. Hatchett concludes, from his experiments, that hair contains gelatine, and owes its suppleness and toughness to that matter. This may be separated by boiling it in water, after which it is much more brittle. If the process be continued for a long time, the hair crumbles in pieces between the fingers. The portion insoluble in water possesses the properties of coagulated albumen. Vauquelin obtained a solution of human hair in water, by raising the temperature of the fluid in Papin's digester. When the heat was too great, it was decomposed, and ammonia, carbonic acid, and an empyreumatic oil formed. Sulphuretted hydrogen is always evolved, and its quantity increases with the heat. The solution of hair effected in this way contains a kind of bituminous oil, which is deposited very slowly. The colour of this oil corresponds with that of the hair. Filtration allows a colourless fluid, in which copious precipitates are formed by infusion of galls and oxymuriatic acid, to pass through. Silver is blackened by it, and acetate of lead precipitated brown. Though very much concentrated by evaporation, it does not concrete into a jelly. Water, containing four *per cent.* of potash, dissolves hair with an evolution of hydrosulphuret of ammonia. A thick oil, differing in colour according to that of the hair, with some sulphur and iron, remains undissolved. Sulphuric, muriatic, and nitric acids dissolve it: with the latter an oil is separated. Oxymuriatic whitens, and then reduces it to a substance of the consistence of turpentine. Alcohol, digested on hair, extracts from it two kinds of oil: the first is white, and subsides in white shining scales as the liquor cools; the second varies according to the hair employed: it is greyish-green when black hair is used, and as red as blood when red is employed. When incinerated it yields iron and manganese, phosphate, sulphate and carbonate of lime, muriate of soda, and a considerable portion of silica. The ashes of red hair contain less iron and manganese; those of white hair still less, but they contain magnesia. The ashes do not exceed 0.015 of the hair. According to the above experiments, performed by Vauquelin, black hair is composed of the nine following substances; 1, an animal matter, which constitutes the greatest part; 2, a white solid oil, in small quantity; 3, a greyish-green oil in greater abundance; 4, iron in an unknown state; 5, oxyd of manganese; 6, phosphate of lime; 7, carbonate of lime, in very small quantity; 8, silica; and 9, sulphur. Thomson's System of Chemistry, book v. chap. 2. sect. 7.

Development of the Hair.—In the first months none can be perceived. When the fibrous part of the cutis begins

to be perceptible, we see a slight down on the head, concealed, in great measure, by the white unctuous matter. The colourless down begins to assume something of the tint which the hair will have after birth, but it is in all cases pale till birth, when it may be half an inch long on the head, although it is only in the state of down in any other part. It grows much more rapidly after birth than before; but is always comparatively lighter in colour in proportion as the subject is younger. The age of puberty witnesses a remarkable change in this system in the development of the beard, of the hair about the organs of generation, and in the axillæ. It undergoes very little change in the following years; but is said to grow more rapidly in summer than in winter. Towards the end of life the hairs feel that general obliteration which affects all the exterior vessels: it ceases to receive colouring matter, and becomes grey. On the subject of this change, see HAIR. After remaining grey for some time they fall off, and the bulbs shrink and disappear. Bichat found no traces of the latter parts in the integuments of perfectly bald old men: but they were entire in the case of a man who had lost his hair from a putrid fever.

It has been very generally supposed that the hair, nails, and epidermis continue to grow after death: but we have no very accurate observations on this subject. Bichat saw the fact in a closely shaven head macerated for eight days: and there is no greater difficulty in admitting this than in allowing that the absorbing vessels can continue their action at the same time. The growth of the hair does not seem to go on at a rate proportioned to the degree of living power: it is as rapid in cases of prostration as in those where these forces are augmented.

Bichat, *Anatomie Generale*, tom. 4. Haller, *Elementa Physiologie*, lib. 12. Cruikshank on the Insensible Perspiration.

INTEGUMENT is also extended to the particular membranes which invest certain parts of the body; as the coats or tunics of the eye.

INTELLECT, a term used among philosophers, to signify that faculty of the soul usually called the *understanding*.

The Peripatetics make two kinds of intellect; *active* and *passive*. See IDEA.

INTELLECTUAL EDUCATION, is that branch of education which respects the understanding, considered in distinction from the affections and dispositions. By intellectual education we understand that series of means by which the various powers, which may be called the intellectual powers, are cultivated; by which those habitual qualities of mind are produced, which immediately respect the acquisition of knowledge, or are essentially auxiliary to it; and by which the mind is stored with those ideas which are subservient to scientific acquirements, or to the arts and pursuits of life.

The full consideration of these objects would lead to three primary divisions of this branch of education: first, the cultivation of the several intellectual powers and qualities; secondly, the value and mode of cultivation of the different branches of knowledge; and thirdly, the peculiar culture of mind and intellectual acquisitions requisite for the different sexes, classes, and professions. In a field so wide, it is necessary to make some selection. In our present article we shall chiefly confine ourselves to a brief consideration of the culture of the leading intellectual powers and qualities. The last of the three divisions (which will include some remarks classing under the second), would in some measure lead us to anticipate what more properly comes under the head of *Moral Education*; and we shall therefore leave the con-

deration of it to that article, for which also we shall, for the same reason, defer a comparative view of the advantages of public and private education.

Though it is not our business, in this department, to enter into the subject of mental philosophy, yet, as in a work so extensive as the present, the same arrangement, views, and employment of terms cannot be expected throughout, we shall find it at least expedient to say more respecting the several powers of the mind than might be in any way requisite, if we were possessed of what will be brought forwards in a more direct form, under its appropriate head: independently of which consideration, we should be induced to give such general views of the intellectual powers as are necessary, in order to understand the principles of education, by the hope that thus we might be the means of exciting the attention of some of our readers to a branch of knowledge which is of peculiar importance, not only in the education of others, but in the cultivation of our own minds.

The first of the intellectual powers in the order of development is of course sensation (or less ambiguously the sensitive power); by which is meant that power or capacity of the mind, by whose operation it receives sensations from things which affect the organs of sense. Proceeding in the same order, we next find the retentive power, without which sensations would be of no avail: this is the power or capacity of the mind, by which it retains reliefs of sensations or ideas. Next succeeds the associative power, which is that power or capacity of the mind by which it connects and compounds ideas. This last principle, if not the sole cause of all our mental phenomena (except the origin of sensations, and the retention of the simple uncompoundd reliefs of them), has some effect in the origin and modification of all of them. It is owing to this important principle that sensations become the signs of thoughts and feelings, by which means man becomes a social being; that the whole mental furniture of perceptions, notions, affections, passions, sentiments, emotions, &c. is formed from the simple reliefs of sensation; that man, from mere sensation, rises to intellect. In short, whatever mental operation we attend to, except at the very earliest period of mental culture, we find association the cause of its productions, or intimately concerned in it.

These three powers may be considered as the elementary powers of the mind, to the operation of which all intellectual phenomena may be referred; but as it is under peculiar modifications and combinations that we see them act, this summary division would be insufficient for our purpose. We shall therefore follow in the order which we find most convenient, a somewhat more minute division of our intellectual principles, according to the combinations, or peculiar modes of operation, of the simple powers; *viz.* sensation, perception, observation, attention, abstraction considered both as a habit and as a power, memory, understanding, and imagination.

I. *Sensations* are the rudiments or elements of all our ideas, that is, of all our thoughts and feelings. When an infant enters into the world, there is no appearance whatever which can authorize any one to assert that there are ideas in its mind; and no one can reasonably doubt, that if a human being could be deprived of all his organs of sensation, before any sensations had been received, that he could never have ideas. In the earliest exercise of the capacity of sensation, sensations are simple, uncompoundd with the reliefs of former corresponding sensations; but the sensations very soon become perceptions, that is, they instantaneously recall the reliefs of other corresponding sensations. That sensa-

tions, in a somewhat advanced state of mental culture, are usually perceptions, any person may satisfy himself, by considering that sensations are usually accompanied either with an idea of an external object causing them, or (if they are merely the effect of the state of the bodily system) with an idea of the sensation being in that part of the body, in which the cause of the sensation exists; both of which are complex ideas, formed from a great number of impressions, and which could in no instance be produced by any exertion of the sensitive power alone, but necessarily require the exercise of the retentive and associative powers.

Considering man as an intellectual being, the correctness and extent of his perceptions are of the first moment. They are, in fact, the materials of all knowledge respecting external objects; and in the early stages of mental culture are the only objects of the understanding. Now, the correctness and extent of the perception depend upon the vividness and efficaciousness of the component sensations, and the number of them received from the same or similar objects in different situations, and through the medium of different senses. One leading object, therefore, in the education of the human being, should be to invigorate and exercise the organs of sense. Independently of the effects of the general healthiness of the system, it appears decidedly probable that the organs of sense are capable of being improved by proper exercise. It is a grand law of our frame, that moderate exertion increases the power of exertion; and there are facts which lead to the same conclusion in this particular case. But this may be safely left to the natural effect of varied exercise. What is principally to be done is, to afford children the opportunity of exercising their senses on a variety of objects, and in a variety of situations. We should think it desirable to proceed a little farther on the cultivation of the organs of sensation; but some observations on this subject will properly form a part of what we shall have to say under the head of *PHYSICAL Education*.

II. By the law of association, many ideas, received directly from sensible objects, through the medium of different senses, become connected, and at last blended together, so as to form one very complex, though apparently uncompounded, idea; and this complex idea is often recalled to the mind by a corresponding sensation; and by association it becomes so connected with that sensation, that the complex idea itself is often mistaken for a part of the sensation. For instance, the sensation produced by the impression made by a globe on the sense of sight, is, as can be proved, nothing more than that produced by a circle, with certain variations of light and shade: yet, immediately on the sensation being received, the ideas of the solidity of the object, of its hardness, of its magnitude, and of its being something external to oneself, (all of which have been derived from the sense of touch, in connection with this object, or others in some respect similar,) immediately rise up in the mind in one blended form; by their complete coalescence they appear to be one, and by their immediate and constant connection with the sensation, they appear to the mind as a part of the sensation. The sensation thus connected with the complex idea is the perception: and by the faculty of perception we understand that compound power (or rather combination of powers) by which perceptions are received from external objects. The accuracy and vividness of the sensation depend upon the sensitive power and its organs: the accuracy and vividness of the perception depend partly upon the accuracy and vividness of the component sensations, and partly upon the activity of the retentive and as-

sociative powers. Supposing the powers of sensation to be in a sound and vigorous state, yet it is obvious that the perceptions will vary very greatly in different individuals, and in the same individual, at different periods. The perception is in fact the sum total of all the notions which the individual has of the object. How much the perceptions of the same object vary in different individuals, may be understood from a simple instance. Suppose a watch to be subjected to the observation of three persons, whose organs of sense are alike healthy and vigorous, the one a very ignorant person, totally unacquainted with its purposes and movements; the second a well-informed person, not however possessed of any acquaintance with the particular mechanism; the third an artist, minutely and completely acquainted with it: the sensation may be precisely the same in all instances; the picture upon the retina may convey to the mind an equally impressive notice of the object; but how different the perception! The first sees a number of minute objects, which attract his attention perhaps by their beauty and regularity; but nothing more: he has no idea of their subserviency to each other or of their general use; there is little more in his case than sensation, indeed we may say, nothing more than sensation besides those associated perceptions which so soon become connected with every impression from external objects, and to which we have already referred. The second, from his general knowledge of mechanism, has some ideas excited by the sensation of use and connection, but he cannot discern the specific kind of connection, nor how each part tends to answer the end of the whole. If he sets about to study the mechanism, he subjects each part to minute examination in its structure and connections; and by degrees may acquire an acquaintance with the whole, which, on a subsequent inspection, would give him an immediate, distinct perception of the parts and purposes. What he thus acquires by laborious and patient examination, the third saw at once. His perceptions have long been cultivated by daily attention to the movements and their dependencies, by studying their defects and excellencies, by the actual formation of various parts, and the construction of the whole: and a great number of the ideas produced by such observations and operations, become so intimately united with the sensation, that at last this at once excites them, and thus he sees (or, more correctly, perceives) what lies totally out of the reach of the observation of others.

From this brief account of the perceptive power, we may readily derive the most essential considerations as to its cultivation. To render the sensations efficacious in forming distinct ideas, and to connect these ideas already derived from any object with the new impressions, depends principally upon the degree of attention (or fixed direction of the mind) which the sensations receive. Hence those who have the care of infants and young children, should give them every opportunity to keep their attention directed to the objects of their senses; and every means should be employed to lead them to such attention. An infant, intently gazing upon an object, or examining it with its little hands and lips, is as usefully employed in the cultivation of intellect as the fondest parent can wish. In the early periods of mental culture there is, however, more to be done in this connection by allowing a child full scope for its own efforts, than by any direct exertions which can be made by others. When its attention is fixed upon any object, let it remain so; if possible let the objects of sense be brought into view under different aspects, and exposed to the examination of different senses. Before words become to a child the signs of vol-

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untary action, all that can be done is to expose it to sensations, and to allow them to fix the attention; but afterwards more direct efforts may be made, and the attention may be fixed by various other means beside the mere action of the sensations themselves.

Children of quick sensations, for the proper cultivation of the perception, require to be frequently induced to observe minutely the objects of perception. We do not venture to go so far as to assert, that it is of no consequence what they observe, provided that they do carefully observe it; but there can be no hesitation in saying, that when the sensations are constitutionally vivid, every instance of close observation given to objects which are within the scope of the comprehension, is cultivating the perception, and contributing to the stock of materials on which the highest efforts of the understanding are to be exercised: and however trifling, in common estimation, those objects may be, yet the mind is receiving a useful employment, and every thing is going on as effectually as could be wished. It is a most erroneous idea in education, that nothing is done except when children are engaged in the usual rudiments of instruction. A child watching the motions of objects around, observing their figure and sounds, examining their structure, is employed in a work which it should be our aim as much as possible to aid and encourage, and from which we may expect very valuable results both on the faculties and furniture of the mind.

The leading point with respect to those whose physical sensibilities are lively, is to engage them to steady observation of the objects of perception; with respect to those whose sensations are by their constitution dull, our efforts must be directed to the awakening of the perceptive power. Whatever is found to stimulate the mind to the exercise of the power, must there be employed. It does not much signify in this case whether, in the first instance, we succeed in producing ideas which will be permanently useful; if the perception is exercised, it will become more vigorous, and by degrees the original dulness of sensation may be in some measure remedied, by the influence of associated feelings. But, in general, dulness of perception does not arise from dulness, and still less from deficiency, in sensation; but from the inefficient employment of the organs of sense. Many lively children are found to be dull in their perceptions; and on the other hand, children whose physical sensibilities are far from vivid, see what their companions see not, and hear what they hear not: the former glance over, and see at a glance, the most impressive objects, or features of an object, but the more minute parts, or the less prominent, and brilliant objects, they do not stay to notice, and though these affect the organs of sense, they make no impression on the mind; the latter more readily dwell on the objects of their sensations, which allows the various parts to call up associated ideas, and in other ways to affect the mind, and thus to make their sensations efficacious.

III The habit of accurate *observation* depends, in a great degree for its foundation, upon the manner in which the perceptive power has been early cultivated, while at the same time it invigorates the perceptions: indeed, in some points of view, it may be regarded simply as the employment of the perceptive power. This habit depends also, especially for its utility, upon the cultivation of the judgment, and upon the associations which become connected with the objects of sense. A child observes, in the first instance, because the notice of the mind is excited by the pleasure or pain accompanying the sensation; afterwards also, through the influence of external motives, that is, associated pleasures or pains.

When the understanding is so far developed as to perceive the uses of different objects, this again increases the motives to observation, and makes it subservient to much valuable cultivation of the intellect. Every fact which is intelligible and interesting to a child respecting the objects of perception, excites the notice of the mind to those objects, at the same time that the communication, reception of it in the mind, and repetition of the *ideas*, increases the stock of knowledge, and exercises the memory and judgment, and often the reasoning powers.

Yet here, as in every branch of education, by aiming to do too much, we may make our best directed exertions ineffectual. To observe with effect, requires patient and frequently repeated attention. To observe is not merely to see, but to see so as to perceive *that*, whatever it be, of which the ever active principle of association has made the visual sensation the symbol or index; and the more the observation is well employed, the more will be brought into the view of the mind by those sensations which to another would not lead on one link in the chain of thought. To force the observation is therefore impossible. We may make our children parrots, by giving them words; but the growth of ideas must be gradual. The observation must first be employed upon directly sensible qualities alone; the more these are noticed, and the ideas of them associated together, (in other words, the clearer the perceptions,) the better foundation is laid for future knowledge. By degrees, and as it is perceived that the mind will bear it, those circumstances and qualities which imply some of the simplest exercises of the understanding, should be brought into view; and from these the skilful instructor (or rather instructress, for we presume that in general the early intellectual education is chiefly conducted, as it will be best conducted, by the female sex) will proceed to others which are still more remote from mere sensation. It will usually be found that children who have been educated in the country, or have had continual opportunities of being in fields and gardens, (other things being equal,) acquire much more completely the habit of observation than those who have been bred up in large towns. In the works of nature there is much more than in the works of art to excite the observation of children, much more in general than can be made the subjects of pleasing instruction; but the judicious parent will not be at a loss to find numerous objects within doors to excite the observation and exercise the perceptive powers; and provided that the observation is actively employed, and correct perceptions are acquired, the mental culture in this essential point is successfully going on.

The habit of observation depends in part upon the general culture of the mind, especially upon the associated thoughts and feelings connected with external objects. The poor plough-boy, with all the advantages that his rustic employments afford him for the excitement of his observation, will often be found extremely deficient in that habit; his perceptions are dull, and his mind is scarcely awakened. Sensations often repeated, without any associations being formed with them, cease to excite the notice of the mind; and where the work of instruction has been totally neglected, as unhappily it so often is among the poor in country situations, the noble powers of the mind lie dormant; there is nothing to rouse its capabilities separate from the narrow round of the daily employments; these soon become mechanical and cease to excite its exertion; and as far as intellect is concerned, the situation is surely less favourable than that of the untutored savage, whose ingenuity and observation are stimulated by the necessities of life.—As the mind, therefore, is capable of receiving them, such ideas should be communicated in connection

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attention with the objects of sensation as are calculated to keep up the interest which the mere sensations at first excite; and thus to continue that attention to them which may gradually render the observation habitual.

It will not be supposed that we would wish the observation to be cultivated, to the exclusion of reflection; the two habits of mind are not in any respect in opposition, in the early periods of education; but, on the contrary, the one materially aids the other. The reflection may be well and successfully exercised upon the ideas which have been left by the absent objects of sense; and indeed it is only upon these that, at first, it can be properly exercised. If this be done, the interest by which the observation is stimulated will be kept up; and, what is not less important, the employment of the observation will be rendered effectual, and will afford materials for after-reflection. The exercise of thought respecting the occurrences of the day, respecting those things which have been the subject of direct observation, in short respecting any object of sensation, is in various points of view of great value; and the more this is employed, the more the mind is prepared for farther observation.

Nevertheless, the period of childhood is more the period of observation than of reflection (or steady attention to our own thoughts and feelings); and it is the former that, in the preparatory parts of education, we should make the primary object. It is of essential value in every branch of education, and in every department of life. The successful acquisition of every science depending upon experiment; indeed the acquisition of knowledge of every kind which depends upon the exercise of the perceptive power, the cultivation of the taste, the common concerns of life, the intercourse of civility, and the efforts of benevolence, require the constant exercise of the habit of observation; and so long as the observation of a child does not rest merely with the immediate objects of perception, but continues to connect with them that information which the instructor communicates, or which has been derived from past observation, it is very usefully employed. Whatever method is found to invigorate and correct the observation, should be frequently made use of; till the understanding has made considerable progress, this should be a leading object in the intellectual culture; and in every period of it, the habit should be frequently brought into exercise. By a proper cultivation of it, the memory and judgment are directly cultivated; and while it strengthens and rouses the energy of the mind, it furnishes it with some of the most serviceable materials for the understanding and imagination.

Those who have been at all engaged in the business of education, well know in what different degrees accuracy and quickness of observation are found, and how important it is for the progress in intellectual acquirements, and often for the moral culture, that the habit should be early and steadily cultivated: and we here wish to express our decided opinion, that the character of the intellect and affections, however much it may be modified by future cultivation, receives its stamp from the employment of the first few years of life; that the education of the nursery is of almost incalculable moment in the mental and moral culture; that by the neglect of it, years of labour may be rendered requisite to compensate in some degree for it; and that by a proper attention to it, a foundation is laid for a clear and vigorous understanding, and lively and pure affections.

IV. *Attention* is an essential constituent part of the habit of observation, and is necessary to every observation of the mind in its first stage. Many corporeal, and even mental opera-

tions may, when become thoroughly habitual, go on without exciting the attention of the mind; and this we have no hesitation in saying, notwithstanding the great authority of Dugald Stewart to the contrary: but this is not the place for the discussion of this point; and what more immediately concerns our purpose is, that before any operation of mind is become habitual, the exercise of it requires the direct notice of the mind, that attention is requisite to render sensations efficacious, that every exercise of the understanding requires it, and that the habitual power of employing it in the direction which the judgment points out, may be regarded as what is most necessary for the attainment of the highest degrees of intellectual culture. In this perfect state it is very rarely to be met with; but in a considerable degree it is frequently acquired; and some good portion of it is so important in every stage of the mental progress, that the formation of the habit cannot be begun too early, nor the cultivation of it made too steady an object.

Attention is now not unfrequently spoken of as a distinct faculty of the mind; and the philosopher to whom we referred in the preceding paragraph has greatly contributed to this change of nomenclature, if he did not begin it. It may perhaps be regarded as a mere verbal distinction if we deny it the appellation; but, in fact, it appears to be, in its simple state, merely the notice of the mind, which in various instances is involuntary, but which by degrees may be connected with volition, and directed by habitual tendency, or direct motives, even in opposition to the strongest impressions from external objects. We may very correctly speak of the power of the mind over its attention, and, by abbreviation, of the power of attention; but the true point of view in which the attention is to be regarded, both when it can be fixed by stimuli of different kinds without the direct intervention of volition, and when it is capable of being produced by direct volition, is as a state or habit, which we would in the one case speak of simply as a state or habit of attention, in the other as the habit of voluntary attention. In very young children the attention is entirely involuntary; the sensible excitements of various kinds which we employ attract the notice of the mind; and the attention is directed to the most impressive excitement. This is very much the case in every stage of education; but under judicious management the state of mind which we call attention may be early produced by the influence of motives without sensible stimulus; and the foundation is then begun for the habit of voluntary attention.

The attention produced by sensible stimulus begins even with the very first sensation which is received. It is a beautiful provision of Providence, that sensations which give pain, while they are the most impressive, are of rare occurrence; and that those which are of most frequent occurrence, or which it is important for the mind to seek for, are attended with pleasure. It is probable that no sensation is at first indifferent; and therefore in the commencement of the growth of intellect, every sensation will excite all the attention which is requisite to give it the degree of efficacy which is necessary for the period. All we then have to do, is to allow the attention to remain where the sensation calls for it. "It is unfortunately in the power of a foolish nurse," says Miss Hamilton, (vol. ii. p. 47-) "to retard the natural progress of the mind, by perpetually interrupting its attention. A child that is much danced about, and much talked to, by a very lively nurse, has many more ideas than one that is kept by a silent and indolent person. A nurse should be able to talk nonsense in abundance; but then she should be able to know when to stop." And the same very respectable writer

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adds in a note, from the observation of a judicious friend, that nothing more effectually tends to retard the progress of the infant faculties than a custom prevalent with nurses, of keeping the child in a continual trot upon the knees; and this especially in cases where its attention is most closely, and therefore most usefully engaged.

But it will not be long before the impressions which have often been received cease, by the diminution of their vividness, to produce the same effect on the mind. When a child has had some cultivation of memory and association, the repetition of a former impression is often much more pleasant than the first reception of a new one; because, if the impression itself is less lively, and in itself considered less pleasant, the associated circumstances often communicate a still more interesting pleasure: the child remembers the pleasure before derived from it; the repetition of it sets his little faculties to work in connection with his former sensation, and the ideas to which it led, and the moderate exercise of the faculties is generally pleasant; and there is often a positive pleasure in the mere repetition of past impressions, even when the disposition of a child is very active, arising from the increased power of fully comprehending the objects causing the impressions. But before the associative power has been much exercised, new sensations are very commonly more attractive than old ones; and here begins that restless desire of novelty, which, while it operates as a most powerful stimulus to the pursuit of knowledge, requires to be carefully watched in every period of education, lest the attention should be completely dissipated, and no knowledge acquired; for there is no principle in education more certain, than that knowledge (clear, correct ideas respecting the objects of sense and intellect) cannot be gained by wandering, hasty attention. At this point the efforts of the parent should be given to lead the little mind to the examination and re-examination of the objects of sensation; not indeed so much by direct influence, as by those little contrivances which a judicious mother so soon learns by experience, and to aid her in which she may consult Miss Edgeworth's excellent observations on the subject, which, though they more immediately refer to a later period of education, suggest many important hints respecting the best methods to be pursued here.

Though we perceive that we shall swell this division of our article beyond what may be thought its due proportion, yet the subject of attention is so important, that we shall select some of Miss Edgeworth's leading observations on the cultivation of the habit, and subjoin our own remarks in addition. In doing this we wish to lead our readers, if they have not already engaged in it, to the study of a work, the value of which we rank higher in proportion to our own experience and observation, and by no means to prevent it. Though in several of her positions we cannot agree, though we think her work essentially deficient, and are by no means satisfied as to the probable result of her plans on the whole, and though to follow them in detail to any considerable extent requires a degree of mental cultivation, and a combination of circumstances, which are very rare in those walks of life where the subject is likely to receive the most attention, yet we cannot hesitate in strongly recommending her work, as containing a fund of very important observations, the result of varied and long-continued experience, guided by sound judgment and good sense, and generally correct moral views, as exhibiting a number of very important phenomena and principles subservient to mental philosophy, and as furnishing to the "practical" parent very valuable aids, even where her plans cannot be minutely followed. Her elementary works ("Early Lessons," "Parents' Assistant," &c.) are incomparable; and if their striking and much-to-be-la-

mented deficiency in every thing like religious principle were suitably supplied, they would leave scarcely a wish ungratified. If any female writer should hereafter come forward to the public, possessing the clearness, simplicity, correctness, and well-stored understanding of an Edgeworth, the brilliant yet chaste imagination and "devotional taste" of a Barbauld, and the energy and high-toned moral principle of a More, divested of bigotry, and founded upon genuine Christian theology, in the scale of utility she will probably stand unrivalled among her contemporaries, however eminent her age may be in every thing great and good. But to return to sober realities.

The three principles which are laid down by Miss Edgeworth in her concluding Summary, as of universal application, are, that the attention of young people should at first be exercised for very short periods; that they should never be urged to the point of fatigue; and that pleasure, especially the pleasure of success, should be associated with the exertions of children. With respect to the first of these points we shall extract the following remarks from her chapter on Attention: "Besides distinctness and accuracy in the language which we use, besides care to produce but few ideas or terms that are new in our first lessons, we must exercise attention but during very short periods. In the beginning of every science pupils have much laborious work, we should therefore allow them time; we should repress our own impatience when they appear to be slow in comprehending reasons, or in furnishing analogies. We often expect that those whom we are teaching should know some things intuitively, because they may have been so long known to us that we forget how we learned them."—"A reasonable preceptor will not expect from his pupil two efforts of attention at the same time; he will not require them at once to learn terms by heart, and to compare the objects which those terms represent; he will repeat his terms till they are thoroughly fixed in the memory; he will repeat his reasoning till the chain of ideas is completely formed. Repetition makes all operations easy; even the fatigue of thinking diminishes by habit. That we should not increase the labour of the mind unseasonably, we should watch for the moment when habit has made one lesson easy, and then we may go forwards a new step."

Respecting the third point, Miss Edgeworth urges, that the stimuli which we employ to excite attention should be proportioned in degree and duration to the mental character of the individual, and the circumstances of the case. "It is not prudent early to use violent or continual stimulus, either of a painful or a pleasurable nature, to excite children to application, because we should, by an intemperate use of these, weaken the mind, and because we may with a very little patience obtain all we wish without these expedients." Besides which, violent motives frequently disturb and dissipate the very attention which they attempt to fix. Regularly recurring motives, which interest, but do not distract the mind, are evidently the best. In proportion as the attention becomes habitual, the excitements producing it should be withdrawn. Success is a great pleasure, and when children have sometimes tasted it, they will exert their attention merely with the hope of succeeding. "Instead of increasing excitements to produce attention, we may vary them, which will have just the same effect. When sympathy fails try curiosity; when curiosity fails, try praise; when praise begins to lose its effect, try blame; and when you go back again to sympathy, you will find that after this interval it will have recovered its original power." At the conclusion of her remarks on this head, Miss E. justly urges the cultivation of the affections of children as a most important means of ac-

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quiring power over their minds, and exciting them to the noblest exertions. "When once this generous desire of affection and esteem is raised in the mind, their exertions seem to be universal and spontaneous: children are then no longer like machines, which require to be wound up regularly to perform certain revolutions; they are animated with a living principle, which directs all that it inspires."

"With *timid* tempers we should begin with expecting but little from each effort, but whatever is attempted should be certainly within their attainment; success will encourage the most timid humility. It should be carefully pointed out to diffident children, that attentive patience can do as much as quickness of intellect: if they perceive that time makes all the difference between the quick and the slow, they will be induced to persevere."

"It is more difficult to manage with those who have *sluggish*, than with those who have *timid* attention;" and with respect to that class of the indolent "who saunter at play and every thing," Miss Edgeworth does not appear to have discovered any remedy. If a child's mind is capable of active exertion in any thing there is hope: the object is to gain the direction of that exertion to the acquisition of knowledge; but the other case she seems to consider as hopeless. Locke's proposal of presenting them (among other stimuli) with fine clothes, eating, &c. she regards as inadequate, but does not suggest any plan by which the love of knowledge may be produced. We doubt whether instances are at all common of such complete want of physical sensibility as she seems to attribute to the sluggish; but "the pain of attention," if it be not excited to something which is beyond the powers of the mind, cannot be so great as to render it preferable to undergo shame and punishment, if judiciously administered. It is probable that a moderate degree of exertion of the faculties is always attended with some pleasure. There are employments which engage the attention, without requiring great effort of mind. The simple operations of arithmetic, the copying of passages from a printed book, &c. are of this kind. If the performance of some of these is steadily made necessary; if temporary abstinence, for instance, or the loss of every thing which is not necessary in diet, be made the regular consequence of determined sluggishness, and the remissness of attention be constantly followed with the trouble of rectifying errors, &c.; in short, if the pain of attention be constantly rewarded by the avoidance of some greater pain, and the comfort of indolence be constantly followed by that greater pain, it cannot be but that in process of time the attention will be less irksome, the mind awakened, and the idea of mental employment accompanied even with satisfaction. If once this state is reached, nothing more is wanting, than to make the attention habitual, to employ it gradually on more difficult objects, and as uniformly as possible to make remissness the source of inconvenience naturally following from it; and to reward exertion by whatever suitable consequence of it is found to gratify the now awakened mind. The most difficult case is, where indolence is united with that quiet amiableness of disposition, and that tolerable degree of good sense, which, united, make those who do not know how to appreciate the ill effects of the baneful quality, yield their affection and approbation, and give the appearance of injustice and harshness to every measure of pain or privation which is employed to excite to exertion.

"*Vivacious* children are peculiarly susceptible of blame and praise; we have therefore great power over their attachment, if we manage these excitements properly. These children should not be praised for their happy hits; their first glances should not be extolled: on the contrary, they

should be rewarded with universal approbation when they give proofs of patient industry, when they bring any thing to perfection."—"To win the attention of vivacious children, we must sometimes follow them in their zig-zag course, and even press them to the end of their train of thought. They will be content when they have obtained a full hearing; then they will have leisure to discover that what they were in such haste to utter was not so well worth saying as they imagined; that their bright ideas often, when steadily examined, fade into absurdities." With respect to children of this character, we think Miss Edgeworth's remarks peculiarly happy; and from many which we might with advantage select, we will transcribe the following: "We should not humour the attention of young people, by teaching them always in the mode which we know suits their temper best. Vivacious pupils should from time to time be accustomed to an exact enumeration of particulars; and we should take opportunities to convince them, that an orderly connection of proofs, and a minute observance of apparent trifles, are requisite to produce the lively descriptions, great discoveries, and happy inventions, which pupils of this disposition are ever prone to admire with enthusiasm. They will learn not to pass over *old* things, when they perceive that these may lead to something *new*; and they will even submit to sober attention, when they feel that this is necessary to the rapidity of genius."

Judicious and useful as these observations are, we are of opinion that Miss Edgeworth has, in her system of education, too much left out of view the actual condition of human nature, that, in every department of life, circumstances are continually occurring in which it is necessary that the attention should be given to objects not in themselves pleasant, from their subserviency to others which are of importance, and that exertions, in like manner, must often be made, to which nothing but a sense of duty would prompt. With respect to the observations which we have extracted, they have all their value, and may be applied, with modifications, not only to the earliest periods of education, but to every succeeding stage; yet her plans strike us as deficient. They are principally calculated for those cases in which, from early example and cultivation, there is a desire of knowledge excited, in which it is imbibed without direct effort on the part of the parent or early instructor, in which, from the habits and pursuits of those around, its advantages are at once felt, and the acquisition of it regarded as of the first importance. In the hands of such teachers as Miss Edgeworth, so well suited to the task by enlightened judgment, steady perseverance, and the ready command of much varied knowledge, with children whose early habits they have themselves formed, whose understandings they have cultivated and furnished with ideas, the processes which she has pointed out may be all which are sufficient; but we doubt whether the ends proposed can, in general, be answered by such means alone; and still more, whether they are, in general, calculated to produce that strength and energy of mind which, with a view to an object fixed upon as important, can steadily pursue a course of arduous exertion.

The habit of attention must be gained in order to make any progress in intellectual culture; that is of course a point decided. It cannot be acquired too early, because thus the utmost efficacy will be given to all the other operations of the mind, and especially to the acquisition of clear, impressive, and serviceable perceptions; that is also a point indisputable. It must, too, be associated with volition as early as possible, and then the foundation is laid for every degree of mental culture to which circumstances may direct.

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We are of opinion, that, after this point, Miss Edgeworth's plans are defective. Her pupils are to be *allured* on too much. The path of knowledge is often a difficult one, and sometimes requires painful efforts; so also the path of duty; and the culture to which her system is chiefly confined, is scarcely calculated to produce that hardy vigour of mind, which, whether the possessor is called to engage in the highest pursuits of science, or in the narrower sphere of social employment and duties, cannot be otherwise than valuable. When the power of voluntary attention is acquired, then the various motives of confidence in the judgment of the teacher, of habitual submission to authority, of affection, and perhaps occasionally of fear, should be employed as circumstances direct, in order to give it strength and activity, to excite the pupil to such employment of it as may make it a hardy vigorous principle, capable of employment, even where the employment may have no intrinsic attraction, and may even be at first positively painful.

If a pursuit can be made attractive to a pupil at the outset, it is well; but if he have acquired that hardness of attention of which we speak, which will enable him to struggle through first difficulties, and perhaps by degrees to take some delight in them, he is then fitted for the acquisition of any branch of knowledge to which his objects in life, or the bent of his own inclination and cultivation of his understanding, may induce his instructor to direct him. If he have not acquired that strength or activity of attention, difficulties which must meet him in the higher departments of literature and science, will often be found to stop him; and however judiciously his attention may have been early cultivated, if it have not acquired this firmness, the attractions of less arduous pursuits, which will still gratify his taste for knowledge, will effectually check all progress.

There are few points in which the cultivation of the intellectual powers is concerned, in which we do not find the importance of the moral habits, particularly of diffidence, of submission, and the desire of doing what is right; where these are suitably produced in the mind by previous education, the culture of the attention very greatly depends upon the instructor. The attention may be restless, or it may be sluggish; but the more suitable efforts are made to render it voluntary, the more it comes under the command. These efforts will be made, if the dispositions are right; and when the attention is once become to a considerable degree voluntary, the direction of it may be obtained (by the influence of those views and motives, which the above-mentioned moral habits put in the power of the instructor,) to whatever object it is thought right to direct it. Thus influenced and directed the way will be comparatively clear. Where the attention is fairly given, the mere employment of the mind becomes itself pleasant. Difficulties will then be overcome, and the pleasure of success will aid every other motive. By degrees the utility of the object begins to be distinctly seen, and the purposes of the different steps which are taken to gain it are also discerned, and then if the habit of patient industry have been formed, or the continued direction of the attention be kept up by the influence of the moral habits, the judgment will aid and encourage every exertion, and at the same time the foundation of a most valuable habit will be laid, of pursuing definite important ends, by the steady use of suitable means.

The habit of attention, or at least the direction of the attention to any object, must sometimes be produced by compulsion, wholly or in part. What kind of compulsion should be employed, and especially whether or not corporeal pain is in any instance expedient for this purpose, and in other departments of education, will be considered

under the head of *MORAL Education*: but we here have only to state the fact, that unless every impression could be regulated by a judicious parent, from the very birth, compulsion must sometimes be employed, even in the best symptoms of education, that education in which compulsion has not been employed, might probably produce amiable characters, but seldom such as will be great in intellectual or moral worth,—that as early education has long been, and it is to be feared long will be, too generally conducted without any steady cultivation of the habits of industry and attention, and of ready submission to authority, the instructor to whom children are committed, whether at home or at school, will commonly find some degree of compulsion necessary, in order to produce that degree of attention which is requisite for any valuable improvement. With respect to this period, and these cases of much neglected mental and moral culture, the chief points appear to be, to proportion the exertion required, as much as possible to the degree, not of actual capacity, but of habits possessed; to abstract as much as possible all causes of inattention, and to generate the impression that the effort must be made. By whatever means the habit of attention is produced and rendered voluntary, and the more frequently and regularly it is produced by volition, the more it becomes at the command of the will, the easier, and consequently the more pleasant it becomes, and the more therefore it can be excited when the motives are sufficiently strong to produce it. It is not, then, “the attention of circumstances,” but the attention of volition: and will then be subject in a great measure to the judgment, guided by a sense of the importance of the object either in itself or to the individual, or to those strong motives which arise from the pleasures of activity, from the gratification of curiosity, the influence of prevailing fashions, the desire of obtaining the approbation of those we love, &c.

When the early training of the mind has made its perceptions distinct and efficacious, and has given it the habit of steady attention, the grand points in intellectual culture are secured; and the rest will proceed, with tolerable ease, in the direction which sound views may dictate.

V. When the attention is directed to some particular object of thought, so as to prevent its being diverted to any other object of thought, or to any external impression, it is denominated *Abstraction*. This state of mind has been seldom dignified with the name of abstraction, except when directed to objects out of the common sphere of thought; but Miss Edgeworth has shewn, by her usual happy method of illustration, that it is the same habit or exercise of mind, whether it be devoted to the highest flights of philosophic pursuit, or to the usual concerns of life. “Persons of ordinary abilities,” she justly remarks; “tradesmen and shopkeepers, in the midst of the tumult of a public city; in the noise of rumbling carts and rattling carriages, amidst the voice of a multitude of people talking upon various subjects, amidst the provoking interruptions of continual questions and answers, and in the broad glare of a hot sun, can command and abstract their attention, so far as to calculate yards, ells, and nails, to cast up long sums in addition right to a farthing, and to make multifarious bills with quick and unerring precision.”

The habit of abstraction is dependent upon various causes; but every person to whom the attainment of it is necessary, finds it susceptible of culture. It much depends upon the familiarity of the impressions which are otherwise most likely to affect the mind: novel impressions from external objects, by their novelty attract the notice of the mind and tend to distract the attention: sensations which have been long

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long and closely connected with trains of thought or feeling, are calculated to divert the attention: objects to which we have been accustomed to attend, in like manner solicit the notice of the mind from those to which we may otherwise wish to attend. In situations, therefore, where we receive novel sensations, unless there is a proportionate devotion of the mind to the object of its attention, these will at first distract the attention; and so on in the other cases. Abstraction depends, too, in part, upon the physical state of the system. If the nervous system is in a strong degree of excitements, external impressions proportionally affect the mind, and, of course, tend the more to distract the attention. Abstraction is likewise seriously impaired by a general tendency to dwell upon the directly selfish feelings, whether pleasurable or painful; because as these are constantly present to the mind, and constitute the most powerful agents, in their immediate effects, upon the mental system, the habitual tendency to give attention to them, puts an almost total stop to any valuable degree of abstraction in favour of those objects, which are not immediately connected with self; and this, by the way, furnishes us with another instance of the influence of moral upon intellectual education. This habit also depends for its vigour, upon the degree in which the interest of the mind can be excited towards an object. With minds of ardour and activity, if the mind be engaged, it is abstracted from every impression and thought, not immediately connected with the object; and if the interest of the mind is strongly excited from any other cause, the same effect will happen. The vigour of abstraction also, depends, in part, upon the degree in which the habit of observation is possessed; indeed they are so much in opposition to each other, that to any considerable degree they are seldom found united in the same individual. The habit of observation implies habitual attention to the objects of sense; the habit of abstraction to the objects of intellect. The habit of abstraction is not therefore to be expected, and indeed ought not to be directly cultivated in the earliest periods of intellectual education. Nevertheless, both qualities depending upon the general habit of close attention, the cultivation of the observation is indirectly laying a good foundation for the subsequent cultivation of the abstraction.

As two objects cannot engross the attention of the mind at the same time, abstraction may be cultivated by rendering the mind habitually inattentive to those objects which are not to occupy it, or by making it habitually attentive to those which are from any cause the objects of preference. The former plan should be adopted, if at all, with great caution. It may generally be left to the efficacy of habit in lessening the efficacy of impressions; and the habitual neglect of any commonly occurring objects of observation or reflection, is inconsistent with the pursuits of life. The second plan is in every point of view preferable; and every instance in which the attention is fixed, whether through direct volition, or by means of excitement without the exercise of volition, is essentially contributing to the cultivation of abstraction; still more so, every instance in which the attention is engaged upon the objects of thought, in situations in which there are frequent impressions from external objects which, if the attention were not so engaged, would then excite the observation. Hence it is desirable to accustom the young to mental exertion where there are causes tending to distract their attention, provided however that from their novelty or their power they are not calculated to force it. Whatever tends to make the objects of the mind interesting, and to give ardour in the pursuit of them, also tends to cultivate the habit of abstraction; for that which deeply interests

the mind, fixes the attention, and of course prevents every other object from sharing the notice of the mind.

The power of directing the mind to objects which afford no impression upon the senses, and even in opposition to such as do, is of extreme importance in the later periods of mental culture, and at the same time, with the assistance of previous culture, is much easier than would, with any cultivation, be possible at an early period. In childhood and youth sensations more affect the mind, than the sensations themselves can do as we advance farther in life; and though associated thoughts and feelings assist to keep up the influence of the sensations themselves, yet if the mind have been accustomed early to think of what are not the direct objects of sensation, the power of its own thoughts and feelings easily overbalances the effect of at least customary sensations. Carried to an undue extent, the habit of abstraction is unsuitable to our situation as social beings; but there is scarcely any plan of life in which it is not in some measure requisite; and in the pursuits of science, whether physical or mental, it is continually required, and continually strengthened by exercise. It is even very important in the events of life. The power of directing the attention to some specific objects of thought, to the exclusion of others, and to the exclusion of external impressions, constitutes (as Miss Edgeworth well observes) the leading feature of that quality which we call presence of mind, and which is so often of signal service to our welfare, and even to the preservation of our lives. And this habit is essentially requisite in our moral and religious culture; the acquisition of religious knowledge constantly implies the employment of abstraction; in the exercise of religious affections it is absolutely necessary; and in the discharge of duty, in opposition to powerful temptations, the power of fixing the attention upon those views and principles which ought to guide us, is of the utmost importance.

The habit of abstraction is in general to be cultivated rather indirectly than directly, in the earlier periods of education; and it is one advantage of the pursuit of knowledge, that it frequently requires fixed attention upon the objects of thought, without aid from the sensations. Perhaps it would be beneficial to extend the occasions for this, in literary and scientific education. An easy demonstration carried on without a figure, an operation in arithmetic suited to the progress of the pupil performed without the aid of the pen or pencil, the description of some former object of observation, the construing or parsing of sentences from the classics without book, and similar exercises of mind, are all calculated to cultivate this habit; and wherever the point can be gained, it greatly increases the power of the mind over its attention. These mental operations may usually be begun early; a child of three or four years of age, can easily be brought to make a little addition *in his head*; and while he does so, his mind must necessarily be occupied to the exclusion of other thoughts and of sensations. If he thinks closely of what he has seen, for the time he is exercising his abstraction. If he is led to think on some of the simple truths of religion, he is exercising his abstraction; indeed these constitute some of the earliest and most powerful exercises of abstraction. It is very important that these and similar mental operations should not be made too frequent, nor continued too long. They should not be continued too long, lest the fatigue of mind experienced should lessen the wish to think, and in reality check the power over the attention; they should not be made too frequent, because, as we have already observed, childhood is the period of observation rather than of abstraction. If the young mind is too much accustomed to think about its own thoughts, the imagination will gain too much power, and that habit of inattention to external

ternal impressions will be formed, which, in most cases, is always injurious, and which in the early period of life is sufficient to stop its progress in intellectual improvement. In this, however, as in every branch of education, our efforts should often be regulated by the prevailing mental habits of the individual. A child of lively conceptions should be directed as much as practicable to accurate observation; where the conceptions are dull, abstraction should be encouraged; and it is encouraged by every instance in which it is exercised with pleasure, by every instance in short, in which the mind is pleasantly engaged upon the objects of thought without the assistance of sensation, and especially if in opposition to sensations. These the intelligent parent has greatly at her command; an account of a walk requiring the recollection of little circumstances and objects which occurred during it, the retracing of ideas on any interesting subject, and various other exercises of a similar kind, contribute to cultivate the abstraction. But after all, it is rather by indirect means, than directly, that we are in the early periods of intellectual culture, to aim to produce and exercise this habit. By early giving a decided bias for intellectual pursuits, and exciting a lively interest in them, and by forming the habit of steady attention to the objects of knowledge as they are presented to the mind, we do in reality prepare it for the cultivation of the habit of abstraction, whenever it may be called for by the higher pursuits of knowledge.

Absence of mind sometimes arises from the mind's being fully occupied with its own trains of thought, but it should not be confounded with abstraction. The latter implies, at least in the commencement of the particular exercise of it, a voluntary direction of the mind: the former, even where it is really caused by mental operations, commonly supposes a want of power over the attention; but it very often arises from a more sluggish inattention to external impressions. Absence of mind, proceeding from this last cause, should be steadily and constantly checked; not so much, however, directly, as by rousing the attention to the objects of sensation, by making the neglect of them unpleasant, &c.: and it should by every means be discouraged in the early periods of education, because it will by degrees induce a tendency to reverie which must almost inevitably give the imagination undue power, and which is more than any quality of mind calculated to destroy all the valuable effects of the habit of well regulated abstraction. In the external appearances, absence of mind proceeding from reverie, differs little, if at all, from the fixed intentional devotement of the mind to some object of thought; but those who have experienced both, and who have watched their characteristics in the young, know that the difference is very important, and deserving of the careful attention of the early instructor. In fact, the habit of reverie is the most baneful possible to the influence of the mind over its trains of thought; and totally destroys, if too much indulged, all power of steadily directing the attention to specific objects of mental pursuit.

VI. We have hitherto spoken of the *habit* of abstraction, by which we understand (agreeably, we believe, to the common acceptance of the term) the devotement of the attention to some objects of thought, to the exclusion of others, and also of impressions from external objects; but it is well known, that the word is also used by some writers on logic and mental philosophy, to denote the *power* which the understanding has (or rather, is supposed to have) of separating the combinations which are presented by it. We introduce the qualifying clause, 'is supposed to have,' because in many cases the understanding has no such power; it is impossible, for instance, to form a conception of extension, without some idea of colour, or of length without breadth;

but in reality, the *abstractive power* is, after all, nothing more or less, than the power of separate attention, the power of attending to one idea distinct from the combination in which it occurs,—of attending to one part of a conception distinct from the rest, and perhaps, by degrees, forming a conception of that part detached from the rest, of attending to one quality or circumstance separate from other qualities or circumstances with which it is really connected, or connected in the mind.

The habit of abstraction, or fixed attention to the objects of thought, is essential to any high degree of mental progress, and is requisite in various circumstances in life; the power of abstraction, or of separate attention to some object of the mind distinct from the combinations in which it is presented, is necessary in almost every process of reasoning, and is the foundation of an accurate, discriminating judgment. The power of abstraction, in this sense, may obviously be cultivated without the exercise of the habit of abstraction; except indeed where the object is purely mental. A child attending to one part of a prospect, to one part of a flower, to one of the sensations which an object presents, (to the colour of a substance, for instance, instead of its smell or shape, or size or weight, or to any one of these without attending to the colours,) is exercising the power of abstraction; and in these very useful exercises of the power of abstraction, the habit of abstraction is not called for; all that is wanting is that of observation. On the other hand, the habit of abstraction may have been cultivated even to excess, without the individual possessing the power of attending to one of a combination of objects, or to a part of a conception, so as not to allow the rest to influence his reasonings and judgment.

The involuntary exercise of the power of abstraction, is very often produced by the mere influence of the associative power, without any effort on the part of the individual, and sometimes by the influence of the sensations themselves. Instances of the latter continually occur. That impression from any object which is the most vivid, attracts the notice of a child; and while the attention is directed to this, the other impressions from it remain unnoticed. But the exercise of the abstractive power is often, in a great measure, voluntary; and though that degree of this power which shall completely separate at once the combinations which are presented to it, is probably altogether chimerical, yet it is in our power to acquire it to such a degree that the parts which we wish to exclude from the attention shall not affect our reasonings, and but little even our feelings. We do not mean that in all cases we have such power; but the more the mind is trained to it, the more it is to be acquired. And here again we perceive the advantage of the pursuits of literature and still more of science. The abstractive power is continually brought into exercise in most of the leading objects of mental occupation. The young are thereby continually led to leave out of view some circumstance or quality, and to direct their attention to the essential points. Every definition that is understood and made the foundation of reasoning, every exercise of classification of words or natural objects according to some system, brings into play this important faculty. It is necessary to every correct judgment, and at the same time the cultivation of the judgment serves as its guide and brings it into exercise.

The abstractive power should be early exercised, but most commonly upon the objects of sensation. Still however not without caution; because, though separate, select attention is of great consequence in the later periods of education, yet in the earlier periods, the first point is correct and extensive observation in order to lay up a fund of ideas for the future operations of the understanding.

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With respect to the operations of the abstractive power, as necessary in the processes of the imagination, they may be very much left to themselves. We have no wish that the imagination should be sacrificed; for it is of great importance in the conduct of life, in the pursuits of science, and in spiritualizing the mind; but where there is that cast of mind which will lead to form new combinations from its conceptions; all that is necessary is, to give the observation frequent opportunities of exercise, in various situations, upon the objects of sensation, that they may be seen under different aspects, and in different combinations. It is in our own power, at any time, to see only parts of an object; and by dwelling upon these parts, we can form conceptions of them detached from others with which they are connected. Hence, the visual conceptions are very easily subjected to the abstractive power; and as to the objects of hearing and smell, they have so little necessary connection with the objects of sight, the sensations can be received, and the conceptions reproduced, so completely independent of visual impressions or conceptions, that there is still less difficulty in exercising the abstractive power upon them. Where, therefore, the imagination has any considerable strength and activity, the abstractive power may be expected to be sufficiently at its command without direct cultivation. Where, however, the imagination is weak or sluggish, it may be advisable, by leading the attention to separate sensations, and to parts of objects distinct from the whole, and by directing the observation to the same objects under different points of view, to cultivate the abstractive power with specific reference to the conceptions as materials of the imagination. And this should occasionally be done with a still higher aim, to accustom the mind to separate the combinations presented to it, in order that those hasty, casual, and erroneous associations may be weakened, which so often completely mislead the judgment, and which, where they do not directly and obviously affect it, imperceptibly warp it, and materially increase the difficulties which obstruct the reception of truth.

VII. By the *Memory* we understand that power which retains ideas, and which can bring them back again to the view of the mind. The latter act is generally known by the name of recollection; the former, as Mr. Stewart has observed, has not yet received any appropriate appellation. It might be called retention; but it appears decidedly preferable to appropriate this appellation to that capacity, or power of the mind, by which reliefs of sensations are retained, by which, in fact, sensations produce ideas.

It is totally unnecessary that we should dwell upon the importance of this power of the mind. Were it not for the capacity of retaining ideas from sensations, man would be a being of mere sensation. But without going to this extent, if the retaining power of the memory were greatly impaired, past impressions, past reasonings, past conclusions, past experience, would be of no service to the mind in the conduct of life, or in the pursuits of science; and without the power of recalling them to the view of the mind when required by circumstances, they would in a great measure lose their efficacy and advantage. To make the memory, however, duly subservient to the usual objects of life, and to the acquisition of knowledge, it must be placed under the regulation of the judgment; and an accurately retentive memory, united with facility of recollection, accompanied with, and guided by, a sound judgment, may be considered as the summit of excellence in this branch of the mental faculties.

To enter into the proper discipline of the memory, when the individual is so far advanced in the cultivation of the

understanding, as to be able to regulate the culture of his own mind, is not our province: and if it were, we should be able to add little to those very excellent and important remarks which our readers will find in Dugald Stewart's elegant and scientific section on the culture of the memory. The question which we have to consider is, what cultivation of the memory is most suited to those periods which are usually devoted to education.

We cultivate the memory indirectly by every instance in which the attention is directed to the objects of sensation; for the vigour and correctness of the memory, so far as it respects external objects, must greatly depend upon the accuracy of the perception. In some points of view it may be considered as the only object at which we need aim with respect to the memory in the earliest periods of education; for where the sensations are duly made the objects of attention, the structure of every mind probably is such, that ideas will be received from them; and the first point is, to gain ideas, which may become the rudiments of perceptions, conceptions, notions, and feelings.

The mere formation of ideas from sensation, is, however, seldom referred to the memory; and though this is a most important object, and serves as the basis for every future operation of the mind, it is so closely connected with the act of sensation, that it can scarcely be distinguished from it. In all probability every impression and every thought which has the notice of the mind, have some effect in modifying or strengthening the corresponding ideas which were previously formed, if they do not form new ideas; and often without our observing the process: but we do not usually speak of such retention as an act of memory, confining the operation of this power to cases in which we can bring again into the view of the mind the objects of observation and reflection. If the ideas produced by observation or reflection have been so much impressed upon the mind, that by active or passive recollection they can be brought again into its view as they were at first produced, the retention and recollection of them are considered as operations of the memory.

As the mere retention of ideas without the power of recalling them, would be of little consequence, and as the recollection of ideas serves greatly to strengthen the retention of them, it appears that one leading object of our aim in the early culture of the memory, should be, to produce the habit of ready, distinct, and accurate recollection. This must of course, in the commencement of intellectual culture, be employed merely upon the objects of sensation, of which the first will be words. When a comparatively small number of words have been acquired, the recollection should occasionally be exercised respecting past sensations; chiefly those of sight, which are in the first instance most easily retained and recalled. By degrees, those which have been received by the sense of hearing, should also be made the subject of recollection; partly with a view to strengthen the power of recollection, but still more the habit of observation, and of attention to those directions which in the early periods of childhood are so essential to well-being, and sometimes even to existence. For several years from birth, it appears to us scarcely desirable to exercise the memory much upon a connected series of words; the power of recollecting words is of great importance in a later period of the mental progress, but in the earlier, the first object is ideas; and young children should seldom (if ever) be required to repeat words without having a clear idea of the meaning of them. Such ideas must necessarily be deficient; but they should be correct as far as they go, and at any rate should be such as the little mind can grasp. If the habit of remembering

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membering words, and of recollecting them, without understanding them, is once begun, there is afterwards a very great difficulty in cultivating the understanding, and in making the memory, what it ought always to be, however important in itself, a subservient faculty.

In the early exercises of the recollection, we are to be fully satisfied with correctness, however deficient it may be in fulness. Correctness (we of course do not mean in the repetition of words, but in the recollection of ideas) should always be aimed at. The imagination will not lose by this; for the correct recollection of conceptions and notions tends to fix them more upon the mind; and these are the materials upon which the imagination is to be employed. Most certainly the understanding will be a gainer; for the object of the understanding is truth; and truth cannot be found by that mind which has been trained up to falsehood by early habit of inaccuracy. We have no objection for the little imagination early to work upon the conceptions which have already been treasured up in the mind, under those limits which continual attention will necessarily set upon the operations of the imagination; only let a child be habituated, in detailing its inventions, to detail them as such; and when recollecting the past objects of observation, to give a faithful outline of them, however imperfect it may necessarily be. We have known an instance in which a child not above four or five years of age, whose imagination was lively, and whose recollection (and perhaps observation also) had unhappily not been trained to accuracy, frequently told his friends circumstances which had no existence except in his own mind, with the regularity, and much of the consistency of real facts, and, probably, by degrees did not know whether he was speaking of the creations of his fancy, or of things which he had actually seen and heard. Such cases must excite our regret for the past, and our apprehension for the future.

Great difficulty often exists, especially in the minds of persons whose conceptions are vigorous, and who have not been habitually careful to cultivate accuracy of perception and correctness in the relation of recollections, to know whether the trains of ideas presented by the associative power are to be referred to the memory or to the imagination. Such persons, seizing only the outline of a fact or series of occurrences, owing to habitual inattention to their sensations, are, from readiness of association, able to fill up the transcript, so as to make it appear plausible to themselves; and by once or twice detailing it without minute regard to accuracy, except in those leading features, they give a degree of vigour to the ideas, and of closeness to the association of them, which at last leads to the full conviction that the whole is recollected. Cases of this sort are very frequent; and they often leave upon the minds of others, the belief that such persons intentionally depart from truth; whereas the fact sometimes is, that part of their error arises from a desire to give the whole truth when they have materials for only a portion of it in their minds. However, the fault is one which should be carefully guarded against, particularly in the early part of life, by making young persons of lively imagination habitually attentive to the minute as well as to the leading parts of their impressions.

Recollection should often be exercised directly; but the main object, after all, is, to acquire the power of bringing forwards our ideas when they are wanting; and it should therefore be often exercised indirectly, by leading to it for those various purposes of life, in which the young are sometimes capable of being useful, and still more, by encouraging the statement of past ideas as they are called up by present objects, especially when the connection is natural and of

a kind likely to be serviceable. This species of recollection obviously depends upon the manner in which the associative power is exercised; and in fact it is itself an exercise of that power, to which the young should be led in every practicable way; in the period of childhood by free communication with their friends on their various pursuits and occupations, and afterwards, in addition to these means, by composition. Continual opportunities occur in almost every department of instruction, for the advantageous recollection of related ideas which have been before received; and it is only by their being brought into employment, and associated with other ideas and trains of thought, that they can be expected to be permanently retained in the mind, or, if retained, to be at its command.

The recollection of ideas is greatly aided by the connection of words both with them, and with the original impressions; for words being, from the constant use of language, familiar to persons of moderate mental culture, even in various combinations, they are easily retained, and most materially assist in producing the recurrence of the corresponding ideas. And thus, when a person is relating a past fact, the ideas in some cases suggest the words, and in others the words suggest the ideas. Hence illiterate persons, other things being equal, do not remember nearly so well as others. Hence also the importance of teaching the young to remember words as well as things; for in most cases, as words serve as the bond of ideas, ideas will be loose and floating in the mind unless connected with words.

After what we have said respecting the memory, we shall not be misunderstood when we say, that the cultivation of it should constitute a very essential object in the early periods of intellectual education. Without a doubt there are original diversities in the capabilities of the mind; and it should be one grand object in mental culture, to excite those which are weak, and to curb and regulate those which are excessive. With respect to the memory, some young persons appear to retain words, and even ideas, with a degree of facility which astonishes and perhaps delights the partial friend, while at the same time it furnishes some ground for alarm, lest that which ought always to be made subservient should have the ascendancy, and prevent due attention to the cultivation of the judgment and reasoning powers. Others are slow in acquiring, but retain for a long time. Others again are distinguished by the readiness with which they recollect, and the ease and aptitude with which they bring forwards what their memory has stored up; and if the memory has been judiciously employed, and the principles of association have been such as are advantageous to the judgment, this is all which can be wished for. With respect to those who possess great facility of retention, it should be the aim of the instructor to encourage, as much as possible, the sound exercise of the judgment, and the long retention and suitable recollection of ideas, rather than the easy acquisition of words, even if properly understood. Durability of retention depends in a great measure upon the manner in which ideas are associated in the mind, and upon the cast of the ideas which have already been received and retained; but this facility of retention, though depending in part upon exercise, seems to arise in no small degree from corporeal organization. It is valuable only as made the foundation of a good memory: it often leads to neglect those exercises of the understanding, to which it should only be auxiliary, because they are more difficult; and the consequence, in innumerable instances, has been, that while apparently the mental progress is going on very rapidly, the judgment, and the reasoning powers, are almost dormant, and the whole of the mental store of the individual consists in the words, or at most the

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the ideas of others, without any real acquisitions of thought, and even without that new-modelling and arranging of them, which would give a degree of appropriation to the possession. We have known an individual arrived almost at the age of manhood, who found it so much easier to learn Euclid's Elements by rote, than to understand them, that he actually went through several of the early propositions without any suspicion being excited that he had not fully mastered them; till on an accidental change in the lettering of the figure, or in the construction itself, it was discovered that memory, not understanding, had been exercised throughout. Where, however, facility in retention is not possessed, though it is by no means the most important feature of the memory, yet it should be cultivated, directly by actual exercise, but still more by well storing the mind with those really valuable ideas which will serve as connecting bonds for new ones. That kind or degree of retention which arises from association, not from original organization, is of the greatest value; and this may be improved to almost any valuable extent, where there is good sense to work upon.

Where the pursuits are directed to the acquisition of literature and science, there is no danger of a want of objects on which to exercise the memory in all its usual qualities. Indeed the danger principally is, of doing too much; and still more, of cultivating the memory almost exclusively. The apprehension of this has led many ingenious persons who have been concerned in education, to do too little. They consider it is unnecessary to exercise the memory more than they think will be probably useful in life, or to burden it with things which, if they should be useful, may be easily acquired when they are wanting. They see the memory often made almost the only object of education, facts stored up without any judicious link of connection, and words, in themselves considered almost unintelligible, and which at any rate convey no ideas to the mind of the learner, committed to memory without explanation; and they go into the opposite extreme, and suppose that the cultivation of the judgment is all which they need attend to. Truth, as in many other instances, lies between the extremes. The cultivation of the memory ought, most assuredly, never to supersede that of the judgment; but, on the contrary, should be kept in subordination to it, and be regulated by it: but when it is considered how many of the purposes of life require accuracy and facility of recollection, how necessary the memory is to the pursuits of science and literature, and even to the cultivation and exercise of the moral sense, can we doubt that as a subservient faculty, and, with a view to its subserviency, we can scarcely cultivate it too much.

Without a doubt, the recollection of ideas is the object of the greatest consequence; but as we have already stated, the memory should often be exercised on *words*, both as an aid to the remembrance of *ideas*, and on account of the great importance of an accurate recollection of words in the usual, as well as in the more peculiar concerns of life. We shall never forget, that, in all probability, the reputed murderers of Steele lost their lives by the definite article being introduced, we doubt not unintentionally, by the reporter of their words; if they said, "We must have had gin there," (not as we believe was stated in evidence, "We must have had the gin there,") their words, so far from being a strong, indeed preponderating argument against them, were plainly consistent, and indeed most consistent, with their reiterated assertions: they were discussing the testimony of the king's evidence; and what they probably said, was designed to account to one another for his representations. We are often led to repeat the statements of others; and it very frequently happens that it is not sufficient to give what we think their ideas.

If we can give their words, every one may judge for himself as to the import of them: if we give merely our own ideas of their import, we preclude all correction of mistake, if from our peculiar prepossessions, or any other circumstances, we have erred. We have ourselves known instances, and probably our readers can at once recollect others for themselves, where very serious consequences have followed from persons detailing their own apprehensions of the meaning of others, instead of what they actually said: and from a regard to truth, and from the consideration of such painful occurrences, we feel persuaded that the habit of the correct recollection of words should be early made an object, and should not be lost sight of in any part of education.

But besides the directly mental effect of the correct recollection of words, and the importance of it in the concerns of life, we do not perceive how the necessity of it can be doubted in the various employments of a literary and scientific education. We have no wish that the memory should be burdened with a number of rules and facts which are of no direct subserviency to the objects of rational instruction; nor that it should be called upon to acquire the principles of grammar, and still less of philosophy, without the continual exercise of the understanding: but though the judgment will afford material aid to the memory, even in the rudiments of the languages, and is of indispensable utility to its exercise in every department of science, yet the ready and accurate recollection of fundamental rules, of the flexions of words, of elementary principles, definitions, &c. is of such signal, and almost essential, advantage, in the progress of education, that we cannot but suppose, either that those who object so much to the frequent exercise of the memory on words, would not wish to be understood to the full extent of their own representations, or otherwise, that they labour under a most material error, arising from ignorance as to what exercise of memory even a rational education requires, or from forgetfulness of those processes by which they have themselves made acquisitions which could not have been made without them.

The exertions of the memory may be classed in three divisions, (as respects our present considerations,) those in which it merely supplies materials for the judgment; those in which it furnishes the results of previous exercises of the understanding, (or at least what have before been the objects of the understanding,) and in which the understanding should still be concerned; and those in which the processes of the memory are become habitual from constant employment, and go on "without our stopping to think." The last class is probably much more extensive than is generally supposed; facility in arithmetic, and in the subordinate exercises in the languages, continually require such an exertion of the memory, and where the memory has not been trained to it, the difficulties in these elementary acquisitions are constantly felt. All the power which we wish the judgment to exercise in such case, is a controlling power; to suggest errors and omissions, but not to direct what is right; and if the readiness and accuracy of memory have not been early cultivated, say before the age of twelve or thirteen, it will often prove up-hill work to acquire facility in those branches of knowledge which, from being of practical value, are of very frequent occurrence. One case has occurred to our own observation, in which the excessive fear of making the memory paramount instead of subordinate, led to such a degree of slowness in every operation in which the judgment is not principally concerned, that the individual found ten-fold difficulties, where the memory of much younger companions (without blindfolding the judgment) suggested at once every thing that the circumstances might require, and will doubtless enable

ble them to succeed best in the usual employments of life. Of course we should prefer the cultivated judgment, with great hesitation of memory, to the most fluent memory without judgment: but fluency in memory may be acquired without sacrificing the judgment; and who would then despise it? One leading object of the work of instruction, in the middle period of it, (perhaps from the age of eight to twelve or farther,) is to give by practice that facility of recollection which, if not acquired before the understanding is become somewhat mature, will seldom be acquired at all; and which, though always to be regarded as a subservient quality, is of almost indispensable utility in the concerns of life, and even in the employments and researches of science.

The remarks in the last paragraph were suggested by what we are advancing on the memory of words, and chiefly refer to it. Words continually stand for many thoughts; and short combinations of them frequently imply trains of reasoning: but it is often sufficient, for the purposes of education, and indeed all that is desirable, that the memory should suggest such combinations, and afford the impression of their accuracy, without the exercise of the understanding to shew the truth of them. Two instances will illustrate our meaning. The common rule of algebraic multiplication, "Like signs give plus, and unlike signs give minus," is in itself considered almost without meaning, and understood literally involves an absurdity; and we would never teach it to a boy, without first shewing him that it is a convenient abridgment of a number of operations in algebraic multiplication, all of which are well-founded: but when he has once seen the universality of its application, we would then lead him to employ it without hesitation, and even without thought as to its meaning: of course, however, recommending that he should never reason from it, but resort to the facts themselves as the foundation of inferences respecting the nature and combinations of algebraic quantities. But to take a more familiar instance; in common multiplication, where the multiplier consists of several digits, we are directed to place the first figure of each product under the digit by which we multiply. Nothing can be easier, when the effect of multiplication by 10, 100, &c., and the nature of our numeration are well understood, than to understand the reason and meaning of the direction; but we should not will that the pupil should continually revert to this explanation; it is sufficient if he remember the fact distinctly, and at the time when it is wanted; and it would only serve to embarrass, if the rationale were to be constantly brought into view.

Leaving out of consideration all the intercourses of life, in which the ready recollection of words is often the source of so much interest and delight, there is still another point of view in which we feel the importance of the habit of recollecting words readily and accurately. Ideas fade from the memory much sooner when they are not connected with words. In sickness, and often in old age, the reasoning powers become languid; and the vigour of the mind, which would supply a succession of interesting thoughts, is lost under the pressure of disease or gradual decay. In such circumstances the mind dwells upon the present impressions of pain, or weakness, and can scarcely raise itself above them; but if the memory have been well stored, in the early part of life, with useful and interesting combinations of words, they will often recur, at such periods, without an effort, and without fatigue, and furnish objects of thoughts which will soothe and even cheer. Those who are subject to any degree of mental depression, disabling them from active efforts, to point out a channel for their thoughts, often find such sug-

gestions of the memory an important relief to them. And we need not say to those of our readers who have a religious turn of mind, that these remarks are peculiarly applicable to those devotional compositions and expressions, which, where they have been early and deeply impressed on the mind, occur at the call of association to support, to strengthen, and to comfort; and which, thus suggested by the memory, have in innumerable instances allayed the emotions of passion and desire, or poured balm into the wounded heart.

Whether the memory should ever be exercised on words which convey no idea to the mind, we do not venture to determine; but as far as our own experience goes, we should be led to conclude that such a cultivation of the memory can be of little service in a rational memory of words. We have at least observed, that where a boy has possessed great facility in committing to memory passages from the classics, without finding it necessary fully to understand them, (so that the recital of them went on with little if any aid from the understanding, but was effected by the mere dint of verbal recollection,) he has usually found it much more difficult to remember passages from English writers, in which the meaning is obvious, though the modes of expression are out of the common rounds. It appears to us, therefore, that exercises of the memory, in which the memory alone is employed, should seldom be resorted to, since it does not tend to produce that recollection of words which is subservient to, and indeed accompanied with a recollection of notions and feelings. The first stage of recollection should be accompanied with the direct exercise of the understanding: the formula of words may, by habit, cease explicitly to excite the ideas which on reflection it would convey; but it should not be attended with a feeling of unmeaningness or unintelligibility.

The only case (separate indeed from the rudiments of language) in which it appears particularly expedient to exercise the memory upon words alone, is where, though they have no usual connection with certain facts or truths, they serve, by an artificial connection, to bring these facts or truths to recollection; and even here there is the feeling in the mind that they are merely abbreviated representations of a more full combination of words, which is itself at once intelligible. We refer principally to such contrivances as those in Grey's *Memoria Technica*. Of course we would by no means recommend the employment of his method to any thing like the extent which he proposes; but if it be of importance (as we are persuaded it is) in the reading of history, that a few leading dates should be well fixed in the mind, his method will be found of great utility by furnishing an additional aid to the memory; and the mere translation of his technical words, assists materially in the permanency of the recollection. Cases may occur, though not very frequently, in which it will be very serviceable to bear in mind with minute exactness the latitude and longitude of places; and here also, the *Memoria Technica* may be found of considerable service: but for the general purposes of geographical knowledge, there can be no doubt that much more benefit will be derived from forming in the mind a clear idea of the relative situation of places, by means of a familiar acquaintance with the globe, or even with maps. Little advantage can be expected from the extension of this method to astronomy, and other branches of physical science; but if any circumstances render it desirable to retain with accuracy the size of the planets, their distances from the sun, &c. or the specific gravity of different bodies, Grey's contrivance will be found a useful aid, though we can never recommend the employment of it in science, without a full previous acquaintance with the facts to which it relates, and a frequent explicit reference to them: in short it should always be employed merely to aid

the remembrance of knowledge, not to enable the young to prate about objects of which they are really ignorant. It is well known to our mathematical readers that there are formulae of eminent utility, in the remembrance of which the judgment can have little share, and in which readiness and accuracy of recollection are the chief objects; for instance, Napier's celebrated canons for the solution of right-angled spherical triangles. Here the short sentence, "the rectangle of the radius and the sine of the middle part, is equal to the rectangle of the tangents of the extremes conjunct, or, of the cosines of the extremes disjunct," enables the calculator to solve with the greatest ease every case of right-angled spherical trigonometry: but in the recollection of this comprehensive canon, the understanding affords little, if any assistance; it is a technical formula, in which there is no opportunity of exercising the perception of truth, except by observing the truth of every class of proportions which may be derived from the application of it; when the truth of these has been demonstrated, all we have to do is to remember the canon. In this and many other instances in the mathematical sciences, a ready and accurate recollection of signs of ideas is of great service; and we cannot have hesitation in maintaining, even from such cases alone, that it is desirable to train the memory, among other objects, to the recollection of words, always indeed as signs of ideas, or abbreviated signs of those which are immediately signs of ideas, and, as much as circumstances will allow, with an explicit exercise of the understanding, but still so as to make the exercise of the memory in these instances the primary consideration. The occasional utility of the recollection of such abbreviations we have already sufficiently adverted to; and we will only add one specimen of the advantage even of the abbreviated statement of these abbreviations. The formula of Napier is readily suggested to the mind by the memorial words *Tan con, Cos-Dis*; and when these are well fixed in the memory, and connected with the more expanded statement of the canon, it is almost impossible that the mind should ever be at any loss in the recollection of the canon itself, or at least of the import of it.

In cases where verbal recollection is found to be an object of importance, the simplest and most correct modes of expression should be employed; and, when they are repeated, it should constantly be done without variation in the order or selection of words. If we can resort to the understanding to check or suggest the words, this is not of so much consequence; but wherever the ready recollection of words is desirable, for purposes of dispatch and accuracy, this precaution will be found of great moment.

We do not mean to charge the later writers on education with being the sole cause of that neglect of the exercise of verbal recollection, which, a few years ago, was prevalent and fashionable at least in domestic education, and which made its way into schools beyond what experience has shewn to be useful; but the unqualified language which has been used by persons of intellectual eminence, aimed, perhaps in some cases exclusively, against burdening the memory with sounds unmeaning to the learner, and almost useless if they were understood, has in many instances been extended to all cases of exact verbal recollection, and has caused great difficulties in the subsequent periods of education as well as in the pursuits of life. We think that Miss Edgeworth stands chargeable with contributing to and supporting this error, not perhaps directly, but by the low estimation in which she teaches us to hold the memory, and by the too unqualified manner of her generally excellent observations on the culture of it, and the subjection of it to the judgment; and we will not deny that we have been led much

farther than we otherwise intended, by our opinion as to the impression which many have derived from her chapter on the subject. Her own writings shew that she herself possesses a judicious memory; but without more attention to the cultivation of the recollection of words than she encourages, we feel persuaded that few will obtain one so serviceable. There is in that chapter a great deficiency in precision and clearness; and it has consequently been the source of much error, or at least countenanced it: and the principle is often obvious, that exertion should be exacted only by being made interesting. Her conclusion, "that memory is chiefly useful as it furnishes materials for invention," is one of these extraordinary positions which can only mislead persons who can implicitly bow to authority, and who prefer quiet acquiescence to the trouble of thinking. It has not unfrequently occurred to us, that it is happy for mankind that the human intellect is not generally to be moulded by theorists; and we have no doubt that in the common walks of life great numbers, not absolutely illiterate, may be found, who, though they possess a tolerable share of good sense and judgment, never have had the merit of forming one new combination of ideas for themselves, and who yet, by the aid of memory, guided, we allow, by the understanding, contrive to pass through life with credit and utility. Viewing Miss Edgeworth's position as limited to science and literature, the subserviency of the memory to invention is only one, and that not the most important department of its exertions; taken as we find it, without any restriction or explanation, the position is as unfounded as it is injudicious.

It is difficult, in education, to lay down any generally applicable rules, especially if they require the specification of ages; but we should be inclined to divide the course of intellectual education into three periods, the first extending to about seven or eight; the second to about twelve or thirteen; and the third to the time when direct instruction ceases. In the first, the exercises of the memory should be constantly and directly subservient to the culture of the understanding, and should not be employed but where they can be made intelligible. In this period the chief object is to produce ideas, and to connect them with words, to cultivate the observation and the judgment, and to store the memory with ideas without much regard to philosophical principles of arrangement. Some notion of causation, however, begins very early in children; and where it can be brought into exercise judiciously, there appears no reason why it should be neglected; but the common bond of union will be connection in time and place, and it is by these links of association principally that recollection will be first produced. In the second period, though the exercise and culture of the judgment should go on as ever, and even become a more prominent object of attention, yet the memory of words should now be particularly cultivated. In the third period, the exercise of verbal recollection should, we imagine, constitute a very subordinate object. The primary aim must then be, to strengthen the judgment, to exercise the operations of reasoning, to cultivate habits of correct generalization and classification; and, as the mind expands, to lay the foundation of that judicious selection and arrangement of the objects of the memory, which will make this faculty of the utmost utility in every valuable employment of the understanding, and indeed make every operation of the memory itself an important exercise of the judgment.

VIII. We now proceed to a few remarks on the cultivation of the *Understanding*. We employ this general term (though in reality it may truly be said to comprehend all the

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the preceding intellectual habits or faculties, principally with a view to those operations, which are usually referred to the heads of judgment and reasoning, and to those operations of the associative power by which ideas are combined and associated with words.

The foundation of an accurate, discriminating judgment, can only be laid in the acquisition of clear perceptions. During the period of infancy (that is, before the use of words is understood), this is almost the sole object of intellectual education; and where this is properly attended to, unless in very unfavourable circumstances, the development of the understanding will afterwards go on with success. Where this has been neglected, the injurious effects are seldom completely remedied. The acquisition of clear perceptions does not, however, necessarily introduce the operations of comparison, discrimination, and judgment; but when these are exercised, the perception is thereby rendered more acute and active. The perceptive powers are necessarily improved in proportion to the attention of the mind to the objects of perception; and whatever excites the operations of the mind, is productive of that pleasure which attends every natural and gentle exercise of the mental faculties, more or less in every period of life, but particularly in those to which education is chiefly directed. Every such exercise of the mental faculties in connection with the objects of perception, tends to excite the attention to those objects, and consequently to improve the perception. And thus it is, as in every period of the intellectual culture, that the proper exercise of one faculty tends to the general improvement of the mind. But to compare, to discriminate, and to judge, does not necessarily follow from the exercise of the perception. In the more complicated perceptions, numerous judgments are often included; but for the formation of those simple ones which are the first exercise of the mind, nothing more is requisite than retention of ideas, and that elementary exercise of the associative power by which two or more ideas, derived from the same or similar objects, are connected with the appearance, &c. of the object, so as to be at once recalled by it, and by degrees combined with it: nevertheless, where the mind is active, and suitable opportunities are given, it very early begins to employ those faculties of the mind on the notions presented by the senses. We have observed, even at the age of twelve months, instances of the most decided nature, proving the attentive examination and accurate discrimination of the objects of sensation. Among others, we recollect to mind a little circumstance which we observed with great satisfaction, where parental partiality was not concerned. A boy, of a fine intelligent cast of countenance, but not at all able to speak, had a strawberry with its stalk on, and a red garden daisy not fully opened, and which very much resembled the strawberry, placed before him. He had several times before eaten strawberries, and of course had an infantine motive for discrimination. He looked first at one, and then at the other; at last he took up the daisy, but without putting it to his nose or mouth, he continued observing it, and after some time he put it down and took up the strawberry, which he almost immediately ate. Hence it might be supposed, on the one hand, that there was an operation of reasoning; and, on the other, that it was simply a judgment, formed by comparison of the sensations.

The truth appears to lie between the two suppositions. As far as we can form an idea of the operation of the infant mind, the case was this. There certainly was considerable resemblance between the two objects, or the child (whose discriminative powers were obviously clear) would have at once chosen the right one; but having taken up the

daisy, it did not, on minute observation, present those appearances which excited the connected pleasurable feelings, already associated with the conception and name of the strawberry, and consequently did not excite the disposition to eat it. The judgment was not a direct intentional one, and consequently differed from those which we employ by the use of words; but the process was the same with that which continually takes place in our own minds. The rejection of the daisy was in consequence of the perception of diversity, or at least the want of perception of complete similarity between the sensation and the conception which had been produced by the frequent sight of the fruit. In this instance we have no doubt that words were employed to set the comparison in motion. Children often understand many words before they can at all utter articulate sounds. The child was probably told that one was a strawberry and the other a daisy, and that he might eat the strawberry.

Such comparisons should often be produced, but at first the objects should, as much as possible, be such, that the comparison may be suggested by the wants of the case; and it should, consequently, be always employed on objects which are completely within the grasp of the mind, at least in the view which we wish to have taken of them. It would be absurd, for instance, to lead a child to compare any of the qualities of a guinea and a shilling, but those which are obvious to the sight or the touch. Instances will be continually occurring (where proper room is given for the exercise of the faculties), in which comparison will take place without any effort on the part of the parent; but it will usually be found expedient sometimes to bring about the employment of the judgment directly; and provided we take care never to make it painful, by displeasure at inaccuracy, or by too much solicitude as to the result, it may be done with great advantage. We never can be without objects to exercise comparison, when children understand the meaning of common words, even if they cannot themselves properly employ them. The size of things, their colour, shape, smoothness, weight, &c. (according to the degree in which the understanding is developed, and the meaning of words understood), furnish constant means for leading to observe resemblances and differences in their various combinations; and the perception of these constitutes discrimination.

These things would doubtless appear trifling to many of our readers; but in all probability those who may consult this article will view things in a different light. Discrimination of judgment is a quality than which no one is more essential in the pursuit of truth; the ready perception of resemblances among diversities, and still more the quick and accurate perception of diversity in the midst of resemblances, constitute some of the most important operations of the understanding. And such discrimination will usually be produced, where the mind is awakened by having sufficient scope and exercise of its faculties. We may often leave it to its own silent progress; and if we encourage accurate and attentive observation, and the correct use of words, discrimination will, in all probability, be found to follow as a natural consequence. But it must also be our endeavour, to awaken and exercise the mind by direct attention on our part; and provided we measure our efforts by the degree in which the understanding is developed, and do not attempt to force it, but only to guide and employ it, we may reasonably indulge the confidence that the work of education is going on successfully, and that we are beginning a progress of intellect, from which the most satisfactory results may be expected.

This quality of accurate discrimination should be kept in view and exercised in every part of education. It is, indeed,

ception, is that which respects *Words*: at least, this is of essential importance. A clear and correct understanding of the force of words, is of the utmost consequence in every period of the intellectual progress. On the care which is early taken in furthering this object, depend, in a great measure, the future development of the understanding and the acquisition of knowledge. A well-educated child will always hesitate to use words which he does not so far understand as to be able to feel their force in the particular connection: and in many instances this is all which can be understood by a child. The names of external objects, are, of course, the first words which are acquired and understood: and here all is plain. Either the things themselves can be shewn, and the words connected with them; or pictures can be employed to represent to the mind what cannot be directly made the subject of perception. In like manner, names denoting the actions of animated objects, and the changes which take place among inanimate objects, the sensible qualities of the different substances around, and, in short, any thing which can be made the subject of direct sensation, or can be represented to the sight, are calculated for the early exercise of the associative power. And it is in the application of these, that the earliest efforts of classification are employed. The same name is unavoidably given to a variety of things or animals agreeing in some particulars; and indeed this circumstance is of the utmost consequence to the progress of intellect. It may be truly said, that without general terms little knowledge could be acquired, that there would be almost a total stop to every process of mind not immediately depending upon sensation. In the first periods of language the business of classification, and the application of general terms, went on together; the processes of classification are now, however, in innumerable instances, directed by the customary mode of applying the terms. Still the application of them is accompanied with classification; and when the mind is, in some instances, a little familiarized with the operation, it acquires, with great ease, the mode of applying general terms in others. This is an excellent and important exercise of the judgment; and it leads to notice circumstances of agreement and circumstances of difference, which is in itself a highly useful employment of the understanding. In some instances children cannot but be puzzled, either by the unavoidable irregularities of language, or by the application of terms depending upon little niceties which cannot be expected to lie within the sphere of their observation; but wherever the grounds of the application can be shewn, it will always furnish a useful exercise of the mind to be led to observe them as such.

We have already referred to the great importance of the mathematical sciences in training the mind to habits of correct reasoning; indeed it is by the various acquisitions of knowledge, that the different mental faculties are developed and cultivated; and we fully expect the concurrence of our readers when we say, that an early and accurate acquaintance with our arithmetical notation and numeration, is peculiarly calculated to lay the foundation of habits of precision, of arrangement and classification. Our notation took its rise in the necessities of circumstances, operating upon those powers and qualities of mind which are possessed by every human being; but it is an object worthy of the attentive examination of the philosopher, while, at the same time, from its distinctness and simplicity, it serves as a most important exercise to the juvenile understanding. A child, early made familiar with the simple operations of arithmetic, (taught, not technically, but by a constant reference to the principles on which they are founded, and particularly to

those of the notation, on which in short the whole depends,) can scarcely fail to form some precise ideas, and to acquire a tendency to arrangement and method, which will almost inevitably lead on to a similar employment of the understanding in other circumstances. It may not perhaps be known to all our readers, that there is an excellent posthumous work of Condorcet, which will furnish some highly valuable information to the intelligent parent, on the best means of communicating an acquaintance with the first principles of arithmetic. It is entitled, "*Moyens d'apprendre à compter sûrement et avec facilité.*" If it were more the object of early education to cultivate the faculties of the mind, rather than to store the memory with words, or with ideas, which are of little importance except so far as they are made an exercise of the understanding, this little tract would not have been so long left inaccessible to the mere English reader. The French editor justly remarks, that the first thing which distinguishes these elements of arithmetic, is, that they are at the same time the elements of the art of reasoning. The usual formulae of arithmetic are founded upon principles and processes which can generally be made intelligible to those who are capable of employing them; but the formulae do not of themselves sufficiently exercise the understanding: they are a species of machinery with which we operate almost mechanically. But in so far as those principles and processes are made intelligible and familiar, the judgment is cultivated, the reasoning powers are exercised, distinct ideas are gained, and the commencement made of those intellectual operations and habits, which are subservient to the highest pursuits of knowledge, and to the best conduct of life.

While we thus recommend the early employment of the understanding upon numbers, we ought not in justice to ourselves to omit mentioning, that natural history furnishes ample scope for the exercise of the intellect on things, on words, and in classification; and in some respects it is a more useful object of early mental culture; it brings into exercise the habit of observation, while it equally requires and more rewards the attention; it gives more room for the exercise of the memory, and is more calculated to set the mind at work, and supplies more numerous and interesting subjects for its operations. "The art of forming a sound and active understanding," says Miss Edgeworth, "consists in a due mixture of facts and reflection. Dr. Reid has, in his *Essay on the Intellectual Powers of Man*, p. 297, pointed out, with great ingenuity, the admirable economy of nature in limiting the powers of reasoning during the first years of infancy. This is the season for cultivating the senses, and whoever, at this early age, endeavours to force the tender shoots of reason, will repent of his rashness." We have not yet been able to meet with the passage to which Miss Edgeworth refers in our 8vo. edition of Reid; but we are fully convinced that she cannot go the whole lengths of that philosopher, respecting the degree in which the reasoning faculty is naturally developed, or rather lies undeveloped, during *childhood*: as we have already remarked, children reason much more than is usually supposed: and provided we are cautious in giving due vigour to the observation and judgment, we may sometimes directly employ the reasoning faculty, under the restrictions which we have already pointed out. Perhaps, however, it is better to be satisfied with those processes of reasoning, which, where the mind is healthy, will almost inevitably follow the exercises of the observation and recollection, and make no direct effort to cultivate the reasoning faculty, than to aim to bring it forwards prematurely; and it was with a view to this principle, that we have thought it desirable to subjoin the foregoing remarks to what we have said on attention to numbers.

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In many cases the force of words can only be learnt gradually, by their use in various connections: to attempt to explain connectives, for instance, by assigning their abstract force, would be utterly useless to a child; the force of them must be shewn in particular cases, and from these the mode of applying them, and the force of them will be learnt in others. Similar remarks may be made with respect to all abstract terms: and provided we are careful ourselves to employ them properly, and to take every opportunity of shewing the force of them when level to the capacity or progress of the individual, we do all which is necessary, and probably do better than by attempting to do more.

Though we fully calculate on our readers going along with us, respecting the absolute necessity of early accustoming the mind to seek for, and to acquire, clear ideas in connection with the signs of ideas, the following remarks of Mr. Locke may serve to corroborate their opinions; and, together with what we shall also quote from Miss More, may lead them to make it an object of daily, indeed constant, aim in the business of education, not merely as of great moment in intellectual cultures, and to smooth the way for intellectual acquisitions, but as incumbent on every one who has in view the moral welfare of his child. "Persons having been accustomed from their cradles," says our great philosopher, "to learn words before they knew the ideas for which they stand, usually continue to do so all their lives, never taking the pains to settle in their minds the determined ideas which belong to them. This want of a precise signification in their words, when they come to reason, especially in moral matters, is the cause of very obscure and uncertain notions. They use these undetermined words confidently, without much troubling their heads about a certain fixed meaning, whereby, besides the ease of it, they obtain this advantage, that as in such discourse they are seldom in the right, so they are as seldom to be convinced that they are in the wrong, it being just the same to go about to draw those persons out of their mistakes, who have no settled notions, as to dispossess a vagrant of his habitation who has no settled abode. The chief end of language being to be understood, words serve not for that end when they do not excite in the hearer the same idea which they stand for in the mind of the speaker."

"I have chosen," adds Miss More, after making the foregoing extract, "to shelter myself under the broad sanction of the great author here quoted, with a view to apply this rule in philology to a moral purpose; for it applies to the veracity of conversation as much as to its correctness; and as strongly recommends unequivocal and simple truth, as accurate and just expression. Scarcely any one perhaps has an adequate conception, how much clear and correct expression favours the elucidation of truth; and the side of truth is obviously the side of morals; it is in fact one and the same cause; and it is of course the same cause with that of true religion also.

"It is therefore no worthless part of education, even in a religious view, to study the precise meaning of words, and the appropriate signification of language. To this end, I know no better method, than to accustom young persons very early to a habit of defining common words and things; for, as definition seems to lie at the root of correctness, to be accustomed to define English words in English, would improve the understanding more than barely to know what those words are called in French, Italian, or Latin. Or rather, one use of learning other languages is, because definition is often involved in etymology, that is, since many English words take their derivation from foreign or ancient languages, they cannot be so accurately understood without

some knowledge of those languages; but precision of any kind, either moral or philological, too seldom finds its way into the education of women."

If any of our readers wish for an exemplification of the method of teaching to define, we refer them, with complete satisfaction, to the excellent little work called "Evenings at Home;" the attentive perusal of which must furnish to the judicious parent, many useful reflections and hints calculated to facilitate his views in intellectual education. We may mention in passing, that we cannot but consider it as a duty which the respectable author owes to the public, to make those alterations in the chemical articles which may adapt it more to the present state of the science; and we are persuaded that he could not render a more useful service to the rising generation, than by some supplementary volumes on other points of natural history and physiology, and natural philosophy, calculated, as those preceding eminently are, to convey clear ideas, and to exercise the understanding. We need scarcely add, that the mathematical sciences furnish most important lessons in the art of defining, and some of the finest and most useful specimens of it.

With respect, however, to the plan of definitions, we must again observe, that in a great variety of instances we must rest satisfied with perceiving that the force of a word is clearly understood in the particular case; and we must sometimes require even less than this. Words which are the most forcible to our minds, in consequence of numerous associated thoughts and feelings, often can scarcely affect the mind of a child. The force of those which represent very complex ideas (as most general terms do), must generally be acquired slowly, by the impressions derived from the manner of their employment, and the instances of their application. But wherever the force of a word can be explained, so as to be made intelligible, this should be done; and there can be no doubt that the habit should be formed as early as possible, of never resting satisfied without some ideas connected with the words which occur in books on conversation. We have ourselves had an opportunity of observing the great value and force of this habit. A young person, who, in the course of his reading aloud with his early instructor, had uniformly been called upon to try to explain the meanings of words, and in case of failure had as uniformly been sent to search for a suitable explanation in a good dictionary which was always at hand, by degrees became so much accustomed to this exercise of the understanding, that, when arrived at years of maturity, he felt a kind of internal compulsion to resort to the same means of information, when he could not otherwise ascertain to his satisfaction the force of a word in a given situation, which feeling generally overcame the reluctance of indolence, and even the eagerness which so often urges on the ardent mind towards that which is yet unexplored. The effect of such discipline upon the habit of discrimination and clearness of intellect need not be pointed out. It can scarcely fail to bring the mind into the right state for the search after truth; and even if only defective ideas are thus acquired, yet if correct as far they go, the grand point is gained. After such habitual culture of the mind, the want of something upon which the understanding may rest with satisfaction is constantly felt; and if the whole truth is not grasped, the acquisitions actually made will usually be on the side of truth.

It appears highly inexpedient to attempt, in the early periods of the mental progress, to give the most comprehensive meanings of words. The first business in the early acquisition of knowledge, is to begin with individuals, and after a suitable acquaintance has been gained with them, to

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go on to general facts and statements. In like manner with respect to words, it is sufficient if we can give a clear idea of the signification of a word as it occurs: it will afterwards be an excellent employment of the understanding to combine these meanings together, so as to generalize the term; and where the mind has been well cultivated, this will be done almost without our direct efforts. But it should not unfrequently constitute a direct exercise in the more advanced periods of education, to trace out that common signification which a word has throughout all its varieties of signification; and previously to this, it is desirable to accustom the young to expect that the particular force of a word which they have acquired is by no means the only one, and to be ready to receive the change of meaning which the circumstances of the connection may require, or which the writer may, by his definitions, endeavour to communicate to his readers.

The wrong application of words is one of the chief obstacles in the acquisition of knowledge, and constitutes the cause of some of our earliest and strongest prejudices. By the magic power of association, not only do the connections of ideas suggest combinations of words, but combinations of words, in innumerable instances, produce connections of ideas. And this ought to furnish to the early instructor, a powerful motive to caution in the employment of words; so that, in his communications with his pupils, he may avoid, not only those modes of expression which are in themselves calculated to convey wrong ideas, but those also which must convey wrong ideas in consequence of the partial knowledge possessed by those who hear them. It should be a leading object, in every department of education, since it is totally impossible to give full and complete ideas, to render those which we can communicate clear and correct. Where this object is steadily pursued, the understanding may be expected for itself to seek, and will, in all probability, acquire all which is necessary beyond.

But notwithstanding all the care and self-culture of parents and instructors, numerous erroneous associations will be formed or imbibed, which will warp the judgment from the perception of truth, and sometimes obscure it. A large proportion of them operate through the medium of the affections; and some attention will be paid to these under the head of *Moral Education*; but still many remain which arise from the ambiguities of language, from partial observation, from accidental combinations of external objects, &c. These will often give way to the gradual development of the mental faculties, and the acquisition of knowledge; but sometimes these irregular associations will continue for a long period to perplex and mislead the understanding. It is highly desirable, therefore, to watch for them, and, where they are discovered, to take suitable means for destroying them. When we perceive a want of readiness to admit obvious truths which are level to the progress of the intellect, we may usually conclude that some incorrect idea has been connected with the words employed. Sometimes the immediate end may be gained by a change of words; but it is, perhaps, generally preferable to endeavour to enter into the little mind and trace its errors and their sources. We remember once discovering that a child had formed the preposterous idea, that the dust which flies about in the road is in part composed of the particles of the human body; an idea derived (by some process of reasoning, which we do not now recollect, aided no doubt by an effort of the imagination,) from impressions received from the words in the burial service, "dust to dust." Here, and in similar cases, to discover the link and to separate it, are almost the same thing. It is one great advantage of

domestic education, that it enables the parent or instructor to watch over the early associations, and to prevent the formation, or effect the disunion, of many which are injurious to the acquisition of knowledge, and what is still more important, unfriendly to the moral judgment, and to the happiness of the individual. To have the power of availing themselves of this advantage, however, parents must accustom their children to view them as friends, to open their little minds to them with the utmost confidence; they must treat their erroneous judgments with mildness, and be habitually careful in their own modes of expression in their presence, and especially in their direct communications with them.

Before quitting the subject of words we would add, that it is very desirable to accustom children to the peculiar terms of science and art, as soon as they can understand their meaning. In very many instances this can be done with ease, not as a formal object, but in the course of conversation, or while explaining what is met with in books. When the terms are become familiar, and are pretty well understood, the difficulties attending the acquisition of any science are greatly lessened. Even familiarity with the mere words employed, is of some service when we begin a new branch of knowledge; but in many cases even clear ideas may be early obtained in connection with scientific language, which will effectually prepare the way for future progress. Suppose, for instance, the leading terms of geometry are early explained, by means of figures or models, not only will the understanding receive some exercise by the acquisition of distinct ideas in connection with words, but it will be ready whenever the reasoning powers are sufficiently matured to be directed to geometry, to enter upon the field without that perplexity which is so often produced by the multitude of new words as well of new ideas. The utmost care should, however, be taken to make our explanations correct as far they go. If possible, children should have nothing to unlearn; and though we cannot effect this completely, yet more depends than is usually supposed upon those who have to guide the early associations and mould the habit; and the less error enters the mind, the more readily will truth find admittance.

XI. "It is more likely," says Miss Edgeworth, "that wit should be engrafted upon judgment, than that judgment should be engrafted upon wit." Numerous excellent observations may be found in her *Practical Education* respecting the cultivation of the understanding; we shall conclude what we have advanced on the subject, by quoting her very judicious remarks on the subject of the early cultivation of wit.

"We have advised, that the judgment of children should be exercised upon the objects of their senses. It is scarcely possible that they should reason upon the subjects which are sometimes proposed to them: with respect to manners and society, they have had no experience, consequently they *can* form no judgment. By imprudently endeavouring to turn the attention of children to conversation that is unsuited to them, people may give the appearance of early intelligence, and a certain readiness of repartee and fluency of expression; but these are transient advantages. Smart, witty children amuse the circle for a few hours, and are forgotten; and we may observe, that almost all children who are praised and admired for sprightliness and wit, reason absurdly, and continue ignorant. Wit and judgment depend upon different and opposite habits of mind. Wit searches for remote resemblances between objects or thoughts apparently dissimilar. Judgment compares the objects placed before it, in order to find out their differences rather than their resemblances.

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stances. The comparisons of judgment may be slow; those of wit must be rapid. The same power of attention in children may produce either wit or judgment. Parents must decide in which faculty, or rather, in which of these habits of the mind, they wish their pupils to excel; and they must conduct their education accordingly. Those who are desirous to make their pupils witty, must sacrifice some portion of their judgment to the acquisition of the talent for wit; they must allow their children to talk frequently at random. Amongst a multitude of hazarded observations, a happy hit is now and then made: for these happy hits children who are to be made wits should be praised; and they must acquire sufficient courage to speak from a cursory view of things; therefore the mistakes they make from superficial examination must not be pointed out to them; their attention must be turned to the comic rather than to the serious side of objects; they must study the different meanings and powers of words; they should hear witty conversation, read epigrams and comedies: and in all company they should be exercised before numbers in smart dialogue and repartee.

"When we mention the methods of educating a child to be witty, we at the same time point out the dangers of this education: and it is but just to warn parents against expecting inconsistent qualities from their pupils. Those who steadily prefer the solid advantages of judgment to the transient brilliancy of wit, should not be mortified when they see their children, perhaps, deficient at nine or ten years old in the showy talents for general conversation; they must bear to see their pupils appear slow; they must bear the contrast of slipshod gaiety and sober simplicity; they must pursue exactly an opposite course to that which has been recommended for the education of wits; they must never praise their pupils for hazarding observations; they must cautiously point out any mistakes that are made from a precipitate survey of objects; they should not harden their pupils against that feeling of shame which arises in the mind from the perception of having uttered an absurdity; they should never encourage their pupils to play upon words; and their admiration of wit should never be vehemently or enthusiastically expressed."

XII. *Imagination* respects the thoughts and the feelings. Considered in reference to the conceptions and trains of thought, it properly falls under the head of Intellectual Education: considered in reference to pleasure and pain, it comes under the head of Moral Education. How the imagination affects the moral judgments, and what influence its pleasures and pains have upon the happiness of life, how they are to be cultivated, and how regulated, will probably be the subject of some remarks in a subsequent article: our business in this will be very brief.

Considered as an intellectual faculty, as assisting to raise the mind above mere sensation, as presenting to the mind conceptions, or trains of conceptions, which are not immediately derived from sensation, (though of course composed of the elements which sensation furnishes,) as forming new combinations of ideas, or as suggesting the grounds of reasoning, the operations of the imagination are very important, and indeed not only powerfully aid the exercise of the judgment, and the pursuits of philosophy, but are even eminently subservient to the cause of morality. Mr. Stewart furnishes us with many admirable observations, which will assist in showing the point to which we should endeavour to raise the imagination, as well as the limits which we should aim to prescribe to it; and from these we shall select the following, as immediately bearing upon our object:

"Point out to two men," says this elegant and interesting

writer, "any object of compassion;—a man, for example, reduced by misfortune from easy circumstances to indigence. The one feels merely in proportion to what he perceives by his senses. The other follows, in imagination, the unfortunate man to his dwelling, and partakes with him and his family in their domestic distresses. He listens to their conversation while they recollect to remembrance the flattering prospects they once indulged; the circle of friends they had been forced to leave; the liberal plans of education which were begun and interrupted; and pictures out to himself all the various resources which delicacy and pride suggest, to conceal poverty from the world. As he proceeds in the painting, his sensibility increases, and he weeps, not for what he sees, but for what he imagines. It will be said, that it was his sensibility which originally roused his imagination; and the observation is undoubtedly true; but it is equally evident, on the other hand, that the warmth of his imagination increases and prolongs his sensibility.

"The foregoing observations may account, in part, for the effect which exhibitions of fictitious distress produce on some persons who do not discover much sensibility to the distresses of real life. In a novel or a tragedy, the picture is completely finished in all its parts; and we are made acquainted, not only with every circumstance on which the distress turns, but with the sentiments and feelings of every character with respect to his situation. In real life we see, in general, only detached scenes of the tragedy; and the impression is slight, unless imagination finishes the characters, and supplies the incidents that are wanting.

"It is not only to scenes of distress that imagination increases our sensibility. It gives a double share in the prosperity of others, and enables us to partake, with a more lively interest, in every fortunate incident that occurs either to individuals or to communities. Even from the productions of the earth, and the vicissitudes of the year, it carries forward our thoughts to the enjoyments they bring to the sensitive creation, and by interesting our benevolent affections in the scenes we behold, lends a new charm to the beauties of nature.

"I have often been inclined to think, that the apparent coldness and selfishness of mankind may be traced, in a great measure, to a want of attention and a want of imagination. In the case of misfortunes which happen to ourselves, or to our near connexions, neither of these powers is necessary to make us acquainted with our situation; so that we feel, of necessity, the correspondent emotions. But without an uncommon degree of both it is impossible for any man to comprehend completely the situation of his neighbour, or to have an idea of a great part of the distress which exists in the world. If we feel therefore more for ourselves than for others, the difference is to be ascribed, at least partly, to this, that, in the former case, the facts, which are the foundation of our feelings, are more fully before us than they possibly can be in the latter."

The power of forming vivid and accurate conceptions is an important acquisition; but the true foundation of it is only to be laid in clear distinct perceptions; and if the imagination early gain such influence as to call off the mind from observation, the most injurious effects may be expected to follow. The exercise of the imagination, (including, as is generally done, what Mr. Stewart denominates the conception,) is necessary to enable us to enter into the reasonings of the philosopher, where these respect individuals, as well as into the pictures of the poet, and the details of history. In reference to this last head, we may be allowed here to mention, that the conception aids the cause even of religious truth: for he who is not able, or who does not take the trouble,

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trouble, to picture to the mind's eye the statements of the gospel historians, will not have his judgment suitably affected with the reality of the facts which they record, nor will his affections be warmed as they ought to be by the contemplation of the character which, with the most artless simplicity, they portray.

Like the memory, though in a different way, the imagination should be made a subservient faculty; and the early cultivation of it must depend upon the tendency which we perceive to the exercise of it, and the degree in which it is likely to gain ground among the intellectual faculties. If the conceptions are very lively, and we perceive a tendency to dwell upon them instead of the objects of perception, our aim must be to invigorate the observation, to cultivate the judgment, and, as much as possible, to turn the efforts of the imagination into the channel of philosophical invention. If, on the other hand, as is sometimes the case, either from early neglect of the observation, or a want of what may perhaps be properly called physical sensibility, the conceptions are very dull, and the mind seems unable to enter into any thing which cannot be made the object of perception or abstract reasoning, it is perhaps desirable, with caution, to stimulate the imagination: and in this view the following remarks of Miss More appear to us to deserve the attention of all who are concerned in education.

"I would not however prohibit such works of imagination as suit this early period. When moderately used, they serve to stretch the faculties and expand the mind; but I should prefer works of vigorous genius, and pure, unmingled fable, to many of those tame and more affected moral stories which are not founded upon Christian principle. I should suggest the use on the one hand of original and acknowledged fictions; and on the other, of accurate and simple facts; so that truth and fable may ever be kept separate and distinct in the mind. There is something that kindles fancy, awakens genius, and excites new ideas in many of the bold fictions of the East. And there is one peculiar merit in the Arabian and some other oriental tales, which is that they exhibit striking, and, in many respects, faithful views, of the manners, habits, customs, and religion of their respective countries; so that some tincture of real local information is acquired by the perusal of the wildest fable, which will not be without its uses in aiding the future associations of the mind in all that relates to Eastern history and literature."

The imagination should early be employed in what is its peculiar field, invention. We do not of course mean, that which has for its object to form combinations with the sole view of pleasing the fancy or gratifying the taste; but that which has in view contrivances to facilitate the purposes of life, and the acquisition of science. We by no means wish to be understood, that in the early part of education, (and still less in the later,) the imagination should never be actively employed on works of fancy and taste; but in a general way it should be laid down as a principle, that the solid and useful qualities of the mind should be cultivated first, the ornamental as a secondary object. The ingenuity and little inventions of children should be encouraged; and where sufficient scope is given for the play of the faculties, and there is no physical cause to prevent activity of mind, not a day will pass, even at a very early age, without some employment in which the inventive power of the imagination is concerned. The inventions of children generally arise, in the first instance, from necessity; but, in their little diversions, they often display, (of course, in a low degree,) the exercise of those qualities by which the most important combinations and inventions have been effected. As they advance

in mental culture, this exercise of the imagination should be more and more submitted to the guidance of the judgment. Many of the literary and scientific pursuits to which the young are directed, have a tendency to cultivate a philosophical imagination; and they furnish numerous opportunities, which a judicious instructor will carefully employ, of calling forth and exercising its most important operations.

Some young persons, we must be contented to allow to pass through life, satisfied if we can make them comprehend the combinations and inventions of others; but it is very seldom, where the mind is active and unshackled, and has been properly stimulated and employed by the usual objects of mental pursuit, that it will rest here. Either in the manner in which it attains to its conclusions, or in which it tries and applies them, or in the conclusions themselves, it will leave the track which may have been beaten by others, and shew the exercise of invention. Novelty ought never to be our object, but truth; but it is pleasant to see any indication of ingenuity; and it should be remembered, that combinations and inventions which are not absolutely new, may be so to the individual.

We shall now finish this head with a few more remarks from Mr. Stewart, which may serve as a restraining check upon the irregular or excessive exercise of the imagination; and may lead the judicious parent to the conclusion with which Miss Edgeworth ends her chapter on the imagination, that it is a good servant but a bad master.

"It was undoubtedly the intention of nature, that the objects of perception should produce much stronger impressions on the mind than its own operations. And, accordingly, they always do so, when proper care has been taken in early life, to exercise the different principles of our constitution. But it is possible, by long habits of solitary reflection, to reverse this order of things, and to weaken the attention to sensible objects to so great a degree, as to leave the conduct almost wholly under the influence of imagination. Removed to a distance from society, and from the pursuits of life, when we have been long accustomed to converse with our own thoughts, and have found our activity gratified by intellectual exertions, which afford scope to all our powers and affections, without exposing us to the inconveniences resulting from the bustle of the world, we are apt to contract an unnatural predilection for meditation, and to lose all interest in external occurrences. In such a situation too, the mind gradually loses that command which education, when properly conducted, gives it over the train of its ideas; till at length the most extravagant dreams of imagination acquire as powerful an influence in exciting all its passions, as if they were realities.

"When such disorders of the imagination have been long confirmed by habit, the evil may perhaps be beyond a remedy; but in their inferior degrees, much may be expected from our own efforts; in particular, from mingling gradually in the business and amusements of the world; or, if we have sufficient force of mind for the exertion, from resolutely plunging into those active and interesting and hazardous scenes, which, by compelling us to attend to external circumstances, may weaken the impressions of imagination and strengthen those produced by realities.

"When a man, under the habitual influence of a warm imagination, is obliged to mingle occasionally in the scenes of real business, he is perpetually in danger of being misled by his own enthusiasm. What we call good sense in the conduct of life, consists chiefly in that temper of mind which enables its possessor to view at all times, with perfect coolness and accuracy, all the various circumstances of his situation; so that each of them may produce its due impression

on him, without any exaggeration arising from his own peculiar habits. But to a man of an ill-regulated imagination, external circumstances only serve as hints to excite his own thoughts, and the conduct he pursues has, in general, far less reference to his real situation, than to some imaginary one, in which he conceives himself to be placed; in consequence of which, while he appears to himself to be acting with the most perfect wisdom and consistency, he may frequently exhibit to others all the appearances of folly."

XIII. In every branch of instruction, and in the mode of conveying it, our first consideration should be, its effect upon the understanding. The mental habits formed, rather than the number of ideas acquired, should be considered as the leading object of attention. We have already intimated, that in a subsequent article we shall have an opportunity of suggesting some observations relative to the manner of communicating knowledge, particularly of the scientific class; and we shall conclude our present article with some remarks which may assist in the appreciation of the value of the common objects of instruction in farthering the cultivation of the intellect, supposing that the best modes of conveying them to the mind have been successfully ascertained. We shall not attempt to follow the natural order of them; but shall be guided by that which appears most suitable to our object.

The acquisition of the *dead languages* forms a leading employment in education; and we trust it will belong before it ceases to be so, though we cannot but regret that it should ever be made an exclusive object. Those who know the intimate connection which subsists between the real command of words, and the noblest exercises of the understanding, will readily allow that the study of language forms a most important auxiliary in intellectual culture. We shall have occasion to specify hereafter to what plans of education the study of the classics should be limited; and this will lead us to enter more at large into the importance of the object. We shall content ourselves therefore, in this place, with stating, that the general advantages of this branch of instruction are, the cultivation of the habits of patience, of attention, of investigation, of accuracy, of discrimination, and of ingenuity; the possession of a key to the ideas contained in those languages; greater power in the use of our own; and the acquisition of numerous data for that branch of mental philosophy which respects language.

Geography exercises the memory, and were it only for its subserviency to history, would be highly valuable; but it has other advantages. It may be made the vehicle for various topics of information, and from these adjuncts, it acquires a rank in the scale of utility, to which, separately considered, it would not be entitled. Independently of this, the habit of associating names with things, and of arrangement, which seems likely to be formed by learning geography, entitle it to a place in the early part of education.

We use the word in its exact though confined sense; and considered as comprehending its adjuncts, the study of it is very important. It leads the mind beyond the narrow sphere of its own observation, enlarges its comprehension, and weakens its prejudices; it forms an interesting link between mere sensation and abstract speculation; it raises the mind above the former, and cultivates and stores it for the latter. Here, however, it obviously borrows its principal utility from what rather comes under the head of civil or natural history, or of natural and mental philosophy.

Natural history, in its various branches, being principally concerned about things, is well adapted for the early stages of mental culture. The study of it forms habits of observation, of attaching distinct conceptions to words (and con-

sequently of using words correctly), of classification, and of attention to objects not connected with self. In all the stages of mental culture, these ends are answered; it gives additional interest to surrounding objects, and leads us to view them as the works of the great Author of nature. We must add here the words of one of our ablest naturalists, in his introduction to his favourite science. "I would recommend botany for its own sake. I have often alluded to its benefits as a mental exercise, nor can any exceed it in raising curiosity, gratifying a taste for beauty and ingenuity of contrivance, or sharpening the powers of discrimination. What, then, can be better adapted for young persons? The chief use of a great part of our education is no other than what I have just mentioned. The languages and the mathematics, however valuable in themselves when acquired, are even more so as they train the youthful mind to thought and observation. In Sweden, natural history is the study of the schools by which men rise to preferment; and there are no people with more acute or better regulated minds than the Swedes."

Mathematical science forms a higher step in the gradation of mental culture. The lowest branch of it is arithmetic. Learnt merely as an art, it is not without its utility in the culture of the mind. We, however, consider it as more comprehensively studied, or rather as *taught* with further views. The commencement of habits of clear perception, of abstraction, of regularity and correctness in practice, of acuteness, of using definite means in order to obtain definite ends, and of acting upon general rules, may reasonably be expected from the proper mode of learning this science. It then becomes an introduction to scientific investigation; and in this view it is peculiarly valuable, from the exact arrangement of our notation, and the certainty of the results of our operations. Algebra possesses nearly the same advantages, and in addition to them, others more important to a higher degree of mental culture. It generates the power of invention and combination, and it accustoms the mind to general reasoning, at the same time leaving it the power to check and correct that reasoning at every step. Geometry forms a habit of clear and cautious reasoning. It serves as a corrective to the wild flights of imagination, and gives proportional vigour to the judgment. The higher branches of mathematical science resemble, in their effects upon the mind, the one of these elementary branches which they most resemble in their mode of investigation. "If there were nothing valuable in the mathematical sciences for the uses of human life, yet they are well worth our study; for by perpetual examples they teach us to conceive with clearness, to connect our ideas in a train of dependance, to reason with strength and demonstration, and to distinguish between truth and falsehood. Something of these sciences should be studied by every one; and that, as Mr. Locke expresses it, not so much to make us mathematicians, as to make us reasonable creatures."

Another source of the utility of the mathematics, is their subserviency to natural philosophy. To describe the phenomena of the universe, to investigate their causes and the connection of these causes, are the principal objects of this science. To mention these objects, is nearly all which is necessary to indicate its valuable effects on the mind. The habits of accurate and persevering observation, of investigation, of abstraction, and of correct reasoning, are more or less produced and cultivated by the study of the philosophy of nature. It furnishes abundant scope for the most sublime speculations, and calls forth the noblest exercises of the imagination, yet restrains the mind within the limits of reality. It carries us beyond the boundaries of sense, and

lessens our interest in self by increasing our concern with every thing around us. It enlarges the comprehension of the soul; for it offers for contemplation the laws of the universe. It prepares the student for an acquaintance with the human mind; for the strictness with which its investigations are conducted, prevents that wildness of theorizing which is the bane of science, and forms the habit of cautiously attending to phenomena, in order to ascertain the general laws which regulate them. It aids the cause of religion; for it accustoms the mind to seek for the causes of observed appearances, and leads it from design and regularity to infer an intelligent First Cause.

History produces or cultivates the habit of pursuing with accuracy a series of connected events or phenomena; of tracing causes from effects, and of observing the operation of causes, either singly, or in their various combinations. The student is concerned about realities, and his judgment is corrected; the web he contemplates is not unfrequently intricate, and his penetration is exercised in unfolding it. He observes the slow operation of moral causes, and he learns patience as to the result of his exertions for the good of others; he sees the efficacy of minute causes operating in conjunction with predisposing circumstances, and he learns prudence in the direction of those exertions. The enlightened study of history prevents the formation, or promotes the eradication of those prejudices which narrow the comprehension of the mind. "There is scarce any folly or vice," says lord Bolingbroke, "more epidemical among the sons of men, than that ridiculous and hateful vanity, by which the people of each country are apt to prefer themselves to those of any other, and to make their own customs, and manners, and opinions, the standard of right and wrong, of true and false." This presents an effectual bar to improvement in the great social concerns of man; and it is apt, perhaps necessarily so, to be accompanied with contracted views of the qualities of those who differ from us in their religious or political sentiments. Now what in one case destroys the illusion tends to dissipate it in the other. He who has learnt to view the qualities and actions of other nations as not to be despised because unlike those of his own, places himself out of his little narrow sphere of self, and gains a comprehensive habit of thought, which will prevent him from refusing to admire those qualities and actions, which can stand the test of reason, in bodies of men, or in individuals who differ from him in their modes of thinking. The study of history is well adapted to the cure of those prejudices. Accustomed to contemplate the history of other nations, to view them in their mutual dependencies and connections, for a time to make their interests our own, we learn to regard the community of which we form a part as itself a part of a still greater community, and without becoming indifferent to its welfare and its excellencies, we acquire the power of discerning the value of opinions and practices which are of foreign growth.

The study of composition derives its value, partly from facilitating our own practice, and partly from putting it in our power, more fully to feel and to appreciate the beauties of the best authors. The practice of composition is highly valuable, because it enables us to benefit others by our mental attainments; to judge of the extent and solidity of those attainments; to command our knowledge; and to make that knowledge clear and substantial. Habits of correct composition are almost necessarily productive of precision in our ideas, of perspicuity in our reasonings; they prevent their possessors from resting satisfied with superficial notions; and they force them to think closely.

The highest scientific object to which the young can

be directed, and what indeed should form the last art of education, is mental philosophy, or the philosophy of the human mind, that science which teaches us the laws of our mental frame, which shews us the origin of our various modes and habits of thought and feeling, how they operate upon one another, and how they are cultivated or repressed. The well directed study of it calls into action and improves the highest intellectual faculties; and while it employs the powers of the mind, it suggests the best means for their culture, and the best mode of their direction. It enables us to trace the intricacies of our own hearts, and points out the proper discipline for their correction. It discovers to us the real excellencies of the mind, and guides us in our efforts for the attainment of them. To success in forming the moral and mental character of others, it is more or less essential; for it discloses the nature of our influence over their minds, and the best mode of exercising it so as to bring their various faculties into the best adjusted and most perfect state. Pursued with proper views, and in a proper manner, it lays the best foundation for the highest degrees of intellectual, moral, and religious improvement. "There are difficulties," to use the words of the great Hartley, "both in the word of God, and in his works; and these difficulties are sometimes so magnified, as to lead to scepticism, infidelity, or atheism. Now the contemplation of our own frame and constitution, appears to me to have a peculiar tendency to lessen these difficulties attending natural and revealed religion, and to improve their evidences, as well as to concur with them in their determination of man's duty and expectations."

The best ground-work for the pursuit of mental science is, an accurate judgment, a discriminating, penetrating intellect, and a habit of correct and cautious reasoning; and therefore the best preparatory culture of mind is the study of the various branches of the mathematics and of natural philosophy. But habits of reflection, and good sense, are all which is essential to the beneficial pursuit of mental science; and with these, it will in all cases lead to results highly important to individual welfare and usefulness. The young in particular will be led, by an acquaintance with the practical laws of the mind, to perceive how their present conduct affects their future character and happiness; to perceive the importance of avoiding a frivolous employment of their time without any end beyond mere amusement; to perceive the impossibility of indulging in vicious gratifications without lessening their means of happiness, and checking their progress towards excellence. They will learn how habits are formed, almost imperceptibly, and, when long exercised, how exceedingly difficult it is to eradicate them; they will learn to consider the formation of habits, as requiring, therefore, their utmost circumspection. They will be enabled to discern what habits of thought and feeling are baneful, what useful; what means of happiness should be regarded as of primary value, what should be regarded as secondary only. In short, there can be no hesitation in affirming, that, next to the immediate pursuits of religion, to which the laws of the mind direct, a judicious acquaintance with those laws is the most important means for the right employment of that period of life on which the happiness of our existence in a great measure depends.

Intellectual Thinking. See THINKING.

INTELLIGIBLE, any thing capable of being understood, or conceived, by the mind.

Philosophers have invented certain beings which are purely intelligible, and only subsist in the understanding: such are the *entia rationis*, universal ideas, and other chimeras.

The

The intelligible, or intellectual world, is the idea of the world in the divine mind, frequently spoken of by Malebranche.

INTEMPERIES, in the *Galenical and Humoral Pathology*, the same with *dyscrasy*, *δυσκράσις*, and the opposite of *temperament*, or *χρῆσις*, *crasis*. As health was supposed to consist in the proper temperament, or proportion of the four qualities of hot and cold, dry and moist; so the *intemperies*, or disproportionate prevalence of any one or two of these qualities, or of the four humours, in which they were supposed to be particularly inherent, was deemed the origin of all diseases: and according to the supposed predominance of this or that quality or humour, each morbid intemperies received its name. Thus when heat or bile prevailed, it was called *intemperies calida*, or biliosa; when cold and phlegm, *intemperies frigida*, and pituitosa; and so on. (See Sennert. *Instit. Medicinæ*, lib. ii. cap. 3.) See **HUMORAL Pathology**, and **GALEN**.

INTENDANT, one who has the conduct, inspection, and management of any thing.

This is a title frequent among the French: they have intendants of the marine, who are officers in the sea-ports, whose business is to take care the ordinances and regulations relating to sea-affairs be observed; intendants of the finances, who have the direction of the revenues; intendants of provinces, who are appointed by the king to take care of the administration of justice, policy, and finances, in the provinces; also, intendants of buildings, of houses, &c.

INTENDMENT of Law, the sense, intention, or true meaning of the law.

The judges ought to judge according to the common intendment of the law.

INTENDMENT of Crimes. In cases of treason, intention proved by circumstances is punishable as if it were put in execution. So likewise, if a person enter the house in the night-time, with intent to commit burglary, it is felony: and an assault on the high-way, with an intent to commit burglary, is felony, and punished with transportation, 23 Car. II. c. 1. 7 Geo. II. c. 21.

INTENSIO, *Lat.* **INTENSO**, *Ital.* *Intense*, in *Music*. Intense sounds are such as are produced with the greatest force, which are loudest, and heard at the greatest distance. They are such sounds likewise, as are produced from strings of greatest tension, and which, on that account, vibrate more powerfully.

INTENSION is a term frequently used by the Greek and other ancient writers on music: intensions of the gravitas, were the major harmonics of the ascent, in the descending major scale of the gravitas, according to M. Overend's Manuscripts in the library of the Royal Institution, vol. vi. p. 7. also, vol. ii. p. 213. in which volumes much information on this curious, but almost obsolete subject, will be found.

INTENSIONE, in *Law*, a writ which lies against him who enters after the death of the tenant in dower, or tenant for life, and holds out him in the reversion, or remainder.

INTENSIONE, *Ital.* as *prima intensione*, in *Music*, as well as painting, implies a *sketch*, a subject, a first design.

INTENSUM DIATONUM. See **DIATONIC** and **GENUS**.

INTENT, in *Civil Law*, signifies to begin or commence an action, or process.

INTENTION, or **INTENSION**, in *Medicine*, that judgment or method of cure, which a physician forms to himself from a due examination of the symptoms.

INTENTION, in *Physics*, the increase of the power, or energy, of any quality; as heat, cold, &c.

By which it stands opposed to *remission*; which signifies its decrease, or diminution.

INTENTION, in *Metaphysics*, denotes an exertion of the intellectual faculties with more than ordinary vigour; when the mind with earnestness fixes its view on any idea, considers it on all sides, and will not be called off by any solicitation.

The schoolmen also speak of terms of first and second intention.

INTENTION, a *Term of First*, is that which signifies a thing; the primary design of men, in establishing words, being to express things, or the ideas they have of things.

INTENTION, a *Term of Second*, is that which does not signify a thing, but another term, or sign.

Thus, a tree, a man, &c. are terms of *first* intention; and the terms in rhetoric, grammar, &c. as figure, kind, &c. are terms of *second* intention.

INTENTION, *Intentio*, *ἐπινοεῖν*, in the *Ancient Music*, was used to denote the passage of the voice from grave to acute.

INTENTIONAL QUALITIES. See **QUALITIES**.

INTER Canem et Lupum, in *Law*, words used formerly in appeals, to signify that a crime was committed in the twilight, i. e. *inter diem et noctem*, &c. This part of a day has divers other denominations: thus, in some parts of England, they call it *mock-shadow*, corruptly *muck-shade*: and, in the north, *day-light's gate*; others say, *betwixt hawk and buzzard*.

INTERAMNA, or **INTERAMNIUM**, (*Teramo*), in *Ancient Geography*, a town of Italy, situated in Latium, very near Campania, on the river Nar, which, from its source to its mouth, served as a boundary between the countries of the Sabines and Umbrians.

INTERCALARY DAY, denotes the odd day inserted in the leap year. See **BISSEXTILE**.

The word is derived from the Latin *intercalaris*, of *calo*, *calare*, which anciently signified, to call with a loud voice: an intercalary day, among the Romans, signifying a day inserted between two other days; which, for that reason, was proclaimed by the priests with a loud voice.

INTERCALATION. See **INTERPOLATION**.

INTERCAPSULARIA, in *Anatomy*, a name given by some writers to the cavities between the scapulae and the vertebrae.

INTERCEPTED AXIS, in *Conic Sections*, is the same with what is otherwise called the *abscissa*.

INTERCESSION, **INTERCESSIO**, was used in *Ancient Rome*, for the act of a tribune of the people, or other magistrate, by which he inhibited the acts of other magistrates; or, even, in case of the tribunes, the decrees of the senate. *Veto* was the solemn word used by the tribunes when they inhibited any decree of the senate, or law proposed to the people. The general law of these intercessions was, that any magistrate might inhibit the acts of his equal, or inferior; but the tribunes had the sole prerogative of controlling the acts of every other magistrate, yet could not be controlled themselves by any.

INTERCESSOR, from *inter* and *cedo*, *I go between*, a person who prays, expostulates, or intercedes, in behalf of another.

In the Roman law, intercessor was the name of an officer, whom the governors of provinces appointed principally to raise taxes, and other duties.

INTERCESSOR is also a term heretofore applied to such bishops as, during the vacancy of a see, administered the bishopric, till a successor to the deceased bishop had been elected. See **BISHOP**.

The third council of Carthage calls these *interventors*.

INTERCIDENT PULSE, a term used by medical writers to express a sort of pulse, in which between two regular strokes there is perceived a third irregular.

INTERCOLUMNIATION, or **INTERCOLUMNATION**, in *Architecture*, signifies the space between two columns. See the plan of *Basilic*, in *Plate Architecture*.

Vitruvius calls it *intercolumnium*; which, according to that author, is of five kinds: viz. *picrostyle*, A, one diameter and a half; *stylobate*, B, two diameters; *eustyle*, C, two and a quarter diameters, which is the most graceful; *diastyle*, D, three diameters; and *archostyle*, E, four diameters; which see explained under their proper heads, **PICNOSTYLE**, &c. The intercolumniation, or space between the columns to the arcade F, is seven and a half diameters; and the intercolumniation wherein there is a space, G, of only one half a diameter, is called coupling columns, an invention ascribed to the moderns.

From a medium, some authors have laid down the following proportions; in the Tuscan order, the intercolumniation, is to be four diameters of the body of the column below; in the Doric, three; in the Ionic, two; in the Corinthian, two one quarter; and in the Composite, one and a half.

INTERCOMMONING is when the commons of two manors lie together, and the inhabitants of both have, time out of mind, caused their cattle to feed promiscuously in each.

INTERCOSTALES, in *Anatomy*, the muscles which fill the intervals of the ribs, and are arranged in two strata, distinguished by the epithets of *external* and *internal*. This region of the body includes also the *levator costarum* and *triangularis sterni*.

The intercostal muscles (*intercostiens*) consist of two thin muscular planes in each of the intercostal intervals, having their fibres disposed obliquely, and attached to the margins of the ribs, which bound these spaces.

The *external intercostal* muscles are attached by their upper edges to the outer border of the lower margins of the ribs, by means of tendinous and fleshy fibres. Their fibres are directed obliquely downwards and forwards; and they are attached below by an insertion exactly resembling the former to the upper edge of the succeeding rib. Various blood-vessels and nerves penetrate them in different parts of the trunk. Their origin begins at that part of the rib which is articulated to the transverse process of the vertebra, and is continued towards the front as far as the junction of the bone with the cartilage; beyond this point the intervals of the cartilages are filled with their aponeurotic fibres, which have similar attachments and direction to the external intercostal muscles.

As the fibres of these external intercostal muscles pass from above obliquely downwards and forwards, they form towards the front acute angles with the upper and obtuse angles with the lower ribs. The posterior fibres are more oblique than the anterior. The stratum placed under the first rib, between it and the second, is called the first intercostal muscle; and those of the following intervals, according to the order in which they succeed, the second, third, &c. to the eleventh.

The external intercostal muscles are covered on their outer surfaces by most of the broad muscles of the trunk, as the two pectorals, obliquus externus abdominis, serratus anticus, and the serrati postici; and in some degree behind by the sacrolumbalis and longissimus dorsi. They correspond on the internal surface to the internal intercostals, from which they are partly separated by the intercostal vessels and nerves. Near the vertebral column they are covered by the pleura.

The *internal intercostal* muscles exactly resemble the former

in situation, attachments, and number. They commence behind at the angles of the ribs, and extend in front to the ends of the cartilages. They are attached to the inner borders of the edges of the ribs; and their fibres proceed in an oblique course from above downwards and backwards, so as to decussate those of the external stratum. They form thinner strata than the external intercostals, are more tendinous, have their fibres less oblique and consequently rather shorter. Sometimes a fasciculus of one or two of the internal intercostals passes over one rib to be fixed into the second. These are very irregular in number, size, and situation, and do not require a separate description: they have however been noticed as distinct muscles by the name of *subcostales*.

As the external intercostals only reach to the ends of the bony portions of the ribs, and the internal do not extend beyond the angles, a small part of the intercostal intervals in front and behind is filled only by a single stratum of fibres; but the remaining and largest part is closed by two layers.

The internal intercostal muscles are covered by the external, from which they are partly separated by the vessels and nerves of the same name. Where the former end in front, the latter are covered by the thin aponeurosis already described. They are lined on the inside by the pleura.

The *levator costarum* (les transverso-costiens) are small, thin, and flat fasciculi of a radiated form, placed behind the external intercostals, from which they are very distinct. They are twelve in number, as each rib has one. Each of these muscles has an aponeurotic origin from the apex of the transverse process of the corresponding dorsal vertebra, or from the ligament connecting the rib to that process; its fibres pass obliquely downwards and forwards, and, growing broader, are attached to the upper edge of the rib immediately below. The levator of the first rib arises from the transverse process of the seventh cervical vertebra, that of the second from the corresponding process of the first dorsal vertebra, and so on to the twelfth. They increase in size regularly from above downwards.

Besides these, each of the two, three, or four lower ribs has a longer fasciculus, arising from the transverse process of the second vertebra above it. These are called *levator costarum longiores*, to distinguish them from the former, which are named *breviares*. They have thin tendinous origins from the transverse processes, pass over the ribs immediately below these processes, and are inserted into the upper borders of the succeeding ribs: thus the first levator longior, arising from the transverse process of the seventh dorsal vertebra, is fixed to the ninth rib.

These muscles are placed between the external intercostals and the sacrolumbalis and longissimus dorsi.

The *triangularis sterni* (sterno-costalis, sterno-costien) is a very thin flattened stratum, of a triangular figure, placed behind the cartilages of the ribs. It is fixed to the posterior part of the edges of the ensiform cartilage, and of the second bone of the sternum, as high as the cartilage of the fourth rib, by aponeurotic fibres, which cover a considerable portion of the muscle. The fleshy fibres, directed outwards and upwards, and more oblique as they are nearer to the upper part, form at first a continuous broad layer, and then divide into separate portions attached by thin aponeuroses to the third, fourth, fifth, and sixth ribs. It is continuous below with the transversus abdominis; corresponds in front to the cartilages of the four last true ribs, to the internal intercostal muscles, and to the mammary vessels; and behind to the pleura, and for a small space to the diaphragm.

The

The motions produced by the muscles in this region are the elevation and depression of the ribs, which coincide with inspiration and expiration. The agents of elevation are the levatores and intercostal muscles, besides other auxiliary powers. The former, fixed to the transverse processes, which are immovable, can obviously exert their action only on the ribs, which they elevate and carry outwards. Thus they increase the transverse diameter of the chest, particularly at its lower part, where, on one hand, the muscles are much stronger, and on the other, in consequence of the greater mobility of the lower ribs, the resistance to be overcome is much less. The action of the intercostals in elevating the ribs is much favoured by the mode of attachment of the first and second of these bones. They possess but little power of motion, and therefore form a fixed point, to which the others can be elevated. They are moreover still further fixed, particularly in deep inspirations, by the scaleni, which may carry them in a slight degree upwards. Both strata, although the directions of their fibres are so different, act equally as elevators: in fact, as the upper part of the chest is fixed, the lower portion must be moved by these powers. In great inspirations, other muscles attached to the chest, as the pectorales, serrati, &c. assist the levatores and intercostal muscles in elevating and turning outwards the ribs.

The depression of the ribs, or their restoration from the elevated to their former state, is nearly a passive motion: it depends, in the first place, on the relaxation of the elevating powers, and then on the elasticity of the cartilages connected to the sternum. These are twisted in the act of elevation, and immediately recover themselves when this force ceases to act. When the depression is more considerable, as in coughing, in difficult expectorations, in sneezing, cases in which a strong expiration is required for the purpose of expelling much air from the chest, an active power is exerted for drawing down the ribs. The triangularis sterni, which has its fixed point in the sternum, depresses the cartilages of the true ribs. The abdominal muscles fix below the loose edges of the false ribs, which thus become a fixed point to which the other ribs may be depressed by the intercostal muscles. Thus the latter muscles are elevators or depressors, according as the fixed point is above or below. Moreover, the quadratus lumborum holds down firmly the last rib; and bears the same relation to that bone in great expirations, which the scaleni do to the two first ribs in deep inspirations. The serratus inferior posticus assists the abdominal muscles on these occasions.

The intercostal muscles and the diaphragm seem to form an exception to that general law of the voluntary muscles, by virtue of which, any muscle after long exercise goes into a state of fatigue, requiring for the reparation of its power an intermission of action, which may be particularly observed in sleep. Now the motions of the chest, beginning and ending with life, are never interrupted. This exception is only apparent; each contraction is succeeded by a proportionate relaxation, so that the time of inactivity of the pectoral muscles equals that of their active state. Moreover, the diaphragm and intercostals mutually supply each other's places: both are said to be employed in inspiration, but sometimes one and sometimes the others are more actively concerned; so that we may consider them in some degree as alternately acting and resting. The intercostals appear to be the most concerned during sleep, and the diaphragm in the waking state. Indeed a considerable contraction of the latter, in some measure, opposes that of the lower intercostals, since it tends to contract the lower cir-

cumference of the chest which the others enlarge. The two strata of the intercostals may contract separately; thus one may rest while the other is employed. Lastly, the levatores may alternate with the latter muscles: thus, although the motions of the chest are constant, their agents, like all the other muscles of the animal life, may be subjected to the law of intermission of action. Hence, if respiration is considerably hurried, and all the inspiratory muscles are brought into action, they are affected with a real lassitude, and at last cannot contract without difficulty. In running, where the blood is carried in great abundance to the heart, and must pass quickly through the chest, we soon lose breath; which is merely experiencing a difficulty in contracting the tired muscles of inspiration. Respiration is then interrupted, as locomotion would be by a fatigued state of the muscles of the lower extremities; and this may even go so far as to produce a real immobility of the inspiratory muscles, a state, which though not dangerous in other instances, as in the organs of locomotion for example, is fatal in the respiratory muscles as it suspends breathing. Examples of animals, and even of men falling suddenly dead after great exertions in running, are not extremely rare. Death occurs in these instances, as when the phrenic nerve or the spinal marrow is divided. Those affections of the chest, in which respiration is hurried for a certain time, occasion at last a real lassitude of the pectoral muscles; and the difficulty of breathing produced by this tired state of the moving organs, succeeding to that produced by the disease itself, prolongs the painful sensation of suffocation. We must distinguish, in these cases, what belongs to the lung, from that which arises from the muscles. After certain hysterical attacks, in which the diaphragm and intercostal muscles have been violently agitated, a real sense of fatigue is experienced in the chest, which can only be moved with difficulty, and not to a sufficient extent for the production of loud sounds, a phenomenon which may be observed also after exertion in running. The muscles require rest before they can expel air in a quantity capable of producing strong and distinct sounds.

INTERCOSTALES Arteriae, arteries which run in the intervals of the ribs: the *intercostales venae* are veins corresponding to those. See **ARTERY** and **VEIN**.

INTERCOSTALES Nervi, are the branches of the spinal marrow in the back, which accompany these arteries and veins. The epithet *intercostales* is sometimes also applied to the great sympathetic nerve. See **NERVE**.

INTERCUS, a word used by some medical writers, to express that sort of dropsy more usually called an *anasarca*.

INTERDICT, a censure inflicted by a pope, or bishop, suspending the priests from their functions, and depriving the people of the use of sacraments, divine service, and Christian burial.

In common law, interdict is also used in the same sense as in the canon law; where it is defined to be, "*censura ecclesiastica prohibens administrationem divinarum.*"

INTERDICT is most properly understood of a general excommunication of a country, or city, as appears by the Decretals. See **EXCOMMUNICATION**.

There is a *local* and a *personal* interdict: where these two are joined, the interdict is said to be *mixed*.

This punishment, as well as general excommunications, were but little known till the time of pope Gregory VII. In the year 1169, pope Alexander III. put all England under an interdict, forbidding the clergy to perform any part of divine service, except the baptizing of infants, taking confession, and giving absolution to dying penitents.

In excommunicating a prince, all his adherents, that is, his

his subjects who retain their allegiance, are excommunicated, and the whole country is put under an interdict. In the reign of king John, the kingdom of England lay under a papal interdict, for above six years together: it began A. D. 1208.

In imitation of the popes, the bishops also soon began to interdict; and it became a common thing for a city, or town, to be excommunicated for the sake of a single person whom they undertook to shelter; but this severity was found to have such ill effects, that they have been obliged to moderate it.

An interdict is denounced, and taken off again, with the same formalities as an excommunication.

INTERDICTS, in the *Roman Law*, certain formulæ of words by which the prætor, when the possession of any thing was contested between many, ordered or forbade something to be done with it, till the right or property should be legally determined.

Which formulæ were called interdicts, because they related to the possession of the thing in the interim, or till the right was ascertained.

They had three kinds of interdicts, *prohibitory*, *restitutory*, and *exhibitory*. *Prohibitory*, were those by which the judges forbade any one to vex another in the possession of any thing legally belonging to him. *Restitutory* were those by which the judges appointed any one, who had been expelled out of his estate to be repossessed, before his right was legally ascertained; and this was the same with what they called the *reintegrant*. *Exhibitory* were those by which any thing in dispute was ordered to be exhibited; as a testament, &c.

There was also a second division of interdicts; *viz.* into *adipiscendæ*, *retineundæ*, and *recuperandæ*: the first tending to the acquiring a new possession, as the *interdict quorum bonorum*, &c., the second to the keeping an old one till it was farther determined, as the *uti possidetis*, &c., the last to the recovering one lost, as *unde vi*, &c.

INTERDICTION of *Water and Fire*, a sentence anciently pronounced against such as, for some crime, were to be banished.

They were not directly adjudged to banishment; but by giving order, that nobody should receive them, but deny them *fire and water*, they were condemned, as it were, to a civil death: and this they called *legitimum exilium*. Livy. See EXILE.

INTEREST, a sum of money reckoned for the loan and forbearance of some other sum, lent for, or due at, a certain time, according to some certain rate.

The sum lent, or forborn, is called the *principal*, because it is the sum that procures the interest, or from which the interest is reckoned.

Interest is either *simple* or *compound*.

INTEREST, *simple*, is that counted from the principal only.

Let p represent the principal, n the number of years or parts of a year, r the interest of $1l.$ for a year, and m the amount of the principal p for the time n at the rate r ; and since the amount of $1l.$ for one year is $1 + r$, the amount of $1l.$ for n years, must be $1 + nr$; the interest of the principal p at the rate r in n years must be pnr ; and $1l.$: $1 + nr :: p : p + pnr = m$ the amount: from this general theorem we can easily deduce problems for resolving all the cases that occur in simple interest.

Prob. 1.—Having any principal sum, and time, and rate of interest given, to find the amount: as $m = p + pnr = p \times 1 + nr$; we shall have this rule: multiply the interest of $1l.$ for a year by the given number of years. Add unity to the product and multiply the sum by the given principal: this second product will be the amount required. *E.g.*

what sum will $567l. 10s.$ amount to in nine years at $5 \text{ per cent. per annum}$? Here $p = 567.5$, $n = 9$, and $r = .05$; therefore $m = p \times 1 + nr = 567.5 \times 1 + .45 = 822.875 = 822l. 17s. 6d.$ Or if it were required to find the amount of one penny at $5 \text{ per cent. simple interest}$ in 1780 years; $p = 1d.$, $n = 1780$, and $r = .05$, therefore $m = 1 \times 1 + 89 = 90d. = 7s. 6d.$

If the time given does not consist of whole years the fractional part may be easily reduced to decimal parts of a year.

Prob. 2.—Having the amount of any principal at a given rate in a given time, to find the principal; it appears,

from the theorem, $m = p \times 1 + nr$, that $p = \frac{m}{1 + nr}$;

i. e. divide the amount by the product of the time and interest of $1l.$ for a year with unity added to it. *E.g.* what principal will amount to $822l. 17s. 6d.$ in nine years at $5 \text{ per cent. per annum}$? Here $m = 822l. 17s. 6d.$ or 822.875 , and n, r as before: therefore $\frac{m}{1 + nr} = \frac{822.875}{1 + .45} = 567.5$, or $567l. 10s.$

Prob. 3.—Having the amount of a given principal at a given rate, to find the number of years. From the theorem we easily deduce, by transposition and division, $n = \frac{m - p}{p r}$, *viz.* subtract the principal from the amount, and divide the remainder by the product of the principal and interest of $1l.$ for a year. *E.g.* in what time will $567l. 10s.$ amount to $822l. 17s. 6d.$ at $5 \text{ per cent. per annum}$? $n = \frac{m - p}{p r} = \frac{822.875 - 567.5}{28.375} = \frac{255.375}{28.375} = 9.$

Prob. 4.—Having the amount of a given principal in a given time, to find the rate, and consequently the interest *per cent.* From the theorem we easily derive $r = \frac{m - p}{p n}$; *i. e.* subtract the principal from the amount, and divide by the product of the principal into the number of years; *e.g.* at what rate *per cent.* will $567l. 10s.$ amount to $822l. 17s. 6d.$ in nine years? Here $\frac{m - p}{p n} = \frac{822.875 - 567.5}{5107.5} = \frac{255.375}{5107.5} = .05$: and, therefore, the interest is 5 per cent.

Prob. 5.—The annual interest of any principal p at the rate r , is $p r$; *i. e.* multiply the principal by the interest of $1l.$ for a year, *e.g.* the interest of $75l.$ for one year at 3 per cent. is $75 \times .03 = 2.25 = 2l. 5s.$ The interest of $157l. 17s. 6d.$ at 5 per cent. is 157.875 (reducing the $17s. 6d.$ to decimals of a pound) $\times .05 = 7.89375 = 7l. 17s. 10\frac{1}{2}d.$ The interest of any principal p at the rate r for n years, is $p r n$; obtained by multiplying the principal, rate, and number of years.

The daily interest is found by dividing the annual interest by 365; thus $.05$, being the interest of one pound for one year at 5 per cent. , divided by 365, the quotient will be $.0001369$, &c. which is the interest of one pound for one day at the same rate. And $\frac{.03}{365} = .0000821$ is the interest of one pound for one day, at $3 \text{ per cent. per annum.}$ The interest for one day, at any rate, being thus found, that interest multiplied by 2, 3, 4, 5, 6, &c. gives the interest of one pound for any number of days; and thus the following table of simple interest for any number of days is easily made.

INTEREST.

A TABLE

Of Simple Interest.—The Interest of One Pound for any Number of Days, &c.

Days.	3 per cent.	2½ per cent.	1 per cent.	1½ per cent.	5 per cent.	Days.	3 per cent.	2½ per cent.	1 per cent.	1½ per cent.	5 per cent.	Days.	3 per cent.	2½ per cent.	1 per cent.	1½ per cent.	5 per cent.	Days.
1	.0000,821	.0000,958	.0001,095	.0001,232	.0001,369	1	.0041,917	.0048,904	.0055,890	.0062,876	.0069,863	51	.0041,917	.0048,904	.0055,890	.0062,876	.0069,863	51
2	.0001,641	.0001,916	.0002,191	.0002,465	.0002,739	2	.0042,739	.0049,863	.0056,986	.0064,109	.0071,232	52	.0042,739	.0049,863	.0056,986	.0064,109	.0071,232	52
3	.0002,465	.0002,876	.0003,287	.0003,698	.0004,109	3	.0043,561	.0050,821	.0058,082	.0065,342	.0072,602	53	.0043,561	.0050,821	.0058,082	.0065,342	.0072,602	53
4	.0003,287	.0003,835	.0004,383	.0004,931	.0005,479	4	.0044,383	.0051,780	.0059,178	.0066,575	.0073,972	54	.0044,383	.0051,780	.0059,178	.0066,575	.0073,972	54
5	.0004,109	.0004,794	.0005,479	.0006,164	.0006,849	5	.0045,205	.0052,739	.0060,274	.0067,808	.0075,342	55	.0045,205	.0052,739	.0060,274	.0067,808	.0075,342	55
6	.0004,931	.0005,753	.0006,575	.0007,397	.0008,219	6	.0046,027	.0053,698	.0061,329	.0069,041	.0076,712	56	.0046,027	.0053,698	.0061,329	.0069,041	.0076,712	56
7	.0005,753	.0006,712	.0007,671	.0008,630	.0009,589	7	.0046,849	.0054,657	.0062,465	.0070,274	.0078,082	57	.0046,849	.0054,657	.0062,465	.0070,274	.0078,082	57
8	.0006,575	.0007,671	.0008,767	.0009,863	.0010,958	8	.0047,671	.0055,616	.0063,561	.0071,506	.0079,452	58	.0047,671	.0055,616	.0063,561	.0071,506	.0079,452	58
9	.0007,397	.0008,630	.0009,863	.0011,095	.0012,328	9	.0048,493	.0056,575	.0064,657	.0072,739	.0080,821	59	.0048,493	.0056,575	.0064,657	.0072,739	.0080,821	59
10	.0008,219	.0009,589	.0010,958	.0012,328	.0013,698	10	.0049,315	.0057,534	.0065,753	.0073,972	.0082,191	60	.0049,315	.0057,534	.0065,753	.0073,972	.0082,191	60
11	.0009,041	.0010,547	.0012,054	.0013,561	.0015,068	11	.0050,137	.0058,493	.0066,849	.0075,205	.0083,561	61	.0050,137	.0058,493	.0066,849	.0075,205	.0083,561	61
12	.0009,863	.0011,506	.0013,150	.0014,794	.0016,438	12	.0050,958	.0059,452	.0067,945	.0076,438	.0084,931	62	.0050,958	.0059,452	.0067,945	.0076,438	.0084,931	62
13	.0010,684	.0012,465	.0014,246	.0016,027	.0017,808	13	.0051,780	.0060,411	.0069,041	.0077,671	.0086,301	63	.0051,780	.0060,411	.0069,041	.0077,671	.0086,301	63
14	.0011,506	.0013,424	.0015,342	.0017,260	.0019,178	14	.0052,602	.0061,369	.0070,137	.0078,904	.0087,671	64	.0052,602	.0061,369	.0070,137	.0078,904	.0087,671	64
15	.0012,328	.0014,383	.0016,438	.0018,493	.0020,547	15	.0053,424	.0062,328	.0071,232	.0080,137	.0089,041	65	.0053,424	.0062,328	.0071,232	.0080,137	.0089,041	65
16	.0013,150	.0015,342	.0017,530	.0019,726	.0021,917	16	.0054,246	.0063,287	.0072,328	.0081,369	.0090,411	66	.0054,246	.0063,287	.0072,328	.0081,369	.0090,411	66
17	.0013,972	.0016,301	.0018,630	.0020,958	.0023,287	17	.0055,068	.0064,246	.0073,424	.0082,602	.0091,780	67	.0055,068	.0064,246	.0073,424	.0082,602	.0091,780	67
18	.0014,794	.0017,260	.0019,726	.0022,191	.0024,657	18	.0055,890	.0065,205	.0074,520	.0083,835	.0093,150	68	.0055,890	.0065,205	.0074,520	.0083,835	.0093,150	68
19	.0015,616	.0018,219	.0020,821	.0023,424	.0026,027	19	.0056,712	.0066,164	.0075,616	.0085,068	.0094,520	69	.0056,712	.0066,164	.0075,616	.0085,068	.0094,520	69
20	.0016,438	.0019,178	.0021,917	.0024,657	.0027,397	20	.0057,534	.0067,123	.0076,712	.0086,301	.0095,890	70	.0057,534	.0067,123	.0076,712	.0086,301	.0095,890	70
21	.0017,260	.0020,137	.0023,013	.0025,890	.0028,767	21	.0058,356	.0068,082	.0077,808	.0087,534	.0097,260	71	.0058,356	.0068,082	.0077,808	.0087,534	.0097,260	71
22	.0018,082	.0021,095	.0024,109	.0027,123	.0030,137	22	.0059,178	.0069,041	.0078,904	.0088,767	.0098,630	72	.0059,178	.0069,041	.0078,904	.0088,767	.0098,630	72
23	.0018,904	.0022,054	.0025,205	.0028,356	.0031,506	23	.0060,000	.0070,000	.0080,000	.0090,000	.0100,000	73	.0060,000	.0070,000	.0080,000	.0090,000	.0100,000	73
24	.0019,726	.0023,013	.0026,301	.0029,589	.0032,876	24	.0060,821	.0070,958	.0081,095	.0091,232	.0101,369	74	.0060,821	.0070,958	.0081,095	.0091,232	.0101,369	74
25	.0020,547	.0023,972	.0027,397	.0030,821	.0034,246	25	.0061,643	.0071,917	.0082,191	.0092,465	.0102,739	75	.0061,643	.0071,917	.0082,191	.0092,465	.0102,739	75
26	.0021,369	.0024,931	.0028,493	.0032,054	.0035,616	26	.0062,465	.0072,876	.0083,287	.0093,698	.0104,109	76	.0062,465	.0072,876	.0083,287	.0093,698	.0104,109	76
27	.0022,191	.0025,890	.0029,589	.0033,287	.0036,986	27	.0063,287	.0073,835	.0084,383	.0094,931	.0105,479	77	.0063,287	.0073,835	.0084,383	.0094,931	.0105,479	77
28	.0023,013	.0026,849	.0030,684	.0034,520	.0038,356	28	.0064,109	.0074,794	.0085,479	.0096,164	.0106,849	78	.0064,109	.0074,794	.0085,479	.0096,164	.0106,849	78
29	.0023,835	.0027,808	.0031,780	.0035,753	.0039,726	29	.0064,931	.0075,753	.0086,575	.0097,397	.0108,219	79	.0064,931	.0075,753	.0086,575	.0097,397	.0108,219	79
30	.0024,657	.0028,767	.0032,876	.0036,986	.0041,095	30	.0065,753	.0076,712	.0087,671	.0098,630	.0109,589	80	.0065,753	.0076,712	.0087,671	.0098,630	.0109,589	80
31	.0025,479	.0029,726	.0033,972	.0038,219	.0042,465	31	.0066,575	.0077,671	.0088,767	.0099,863	.0110,958	81	.0066,575	.0077,671	.0088,767	.0099,863	.0110,958	81
32	.0026,301	.0030,684	.0035,068	.0039,452	.0043,835	32	.0067,397	.0078,630	.0089,863	.0101,095	.0112,328	82	.0067,397	.0078,630	.0089,863	.0101,095	.0112,328	82
33	.0027,123	.0031,643	.0036,164	.0040,684	.0045,205	33	.0068,219	.0079,589	.0090,958	.0102,328	.0113,698	83	.0068,219	.0079,589	.0090,958	.0102,328	.0113,698	83
34	.0027,945	.0032,602	.0037,260	.0041,917	.0046,575	34	.0069,041	.0080,547	.0092,054	.0103,561	.0115,068	84	.0069,041	.0080,547	.0092,054	.0103,561	.0115,068	84
35	.0028,767	.0033,561	.0038,356	.0043,150	.0047,945	35	.0069,863	.0081,506	.0093,150	.0104,794	.0116,438	85	.0069,863	.0081,506	.0093,150	.0104,794	.0116,438	85
36	.0029,589	.0034,520	.0039,452	.0044,383	.0049,315	36	.0070,684	.0082,465	.0094,246	.0106,027	.0117,808	86	.0070,684	.0082,465	.0094,246	.0106,027	.0117,808	86
37	.0030,411	.0035,479	.0040,547	.0045,616	.0050,684	37	.0071,506	.0083,424	.0095,342	.0107,260	.0119,178	87	.0071,506	.0083,424	.0095,342	.0107,260	.0119,178	87
38	.0031,232	.0036,438	.0041,643	.0046,849	.0052,054	38	.0072,328	.0084,383	.0096,438	.0108,493	.0120,547	88	.0072,328	.0084,383	.0096,438	.0108,493	.0120,547	88
39	.0032,054	.0037,397	.0042,739	.0048,082	.0053,424	39	.0073,150	.0085,342	.0097,534	.0109,726	.0121,917	89	.0073,150	.0085,342	.0097,534	.0109,726	.0121,917	89
40	.0032,876	.0038,356	.0043,835	.0049,315	.0054,794	40	.0073,972	.0086,301	.0098,630	.0110,958	.0123,287	90	.0073,972	.0086,301	.0098,630	.0110,958	.0123,287	90
41	.0033,698	.0039,315	.0044,931	.0050,547	.0056,164	41	.0074,794	.0087,260	.0099,736	.0112,191	.0124,657	91	.0074,794	.0087,260	.0099,736	.0112,191	.0124,657	91
42	.0034,520	.0040,274	.0046,027	.0051,780	.0057,534	42	.0075,616	.0088,219	.0100,821	.0113,424	.0126,027	92	.0075,616	.0088,219	.0100,821	.0113,424	.0126,027	92
43	.0035,342	.0041,232	.0047,123	.0053,013	.0058,904	43	.0076,438	.0089,178	.0101,917	.0114,657	.0127,397	93	.0076,438	.0089,178	.0101,917	.0114,657	.0127,397	93
44	.0036,164	.0042,191	.0048,219	.0054,246	.0060,274	44	.0077,260	.0090,137	.0103,013	.0115,890	.0128,767	94	.0077,260	.0090,137	.0103,013	.0115,890	.0128,767	94
45	.0036,986	.0043,150	.0049,315	.0055,479	.0061,643	45	.0078,082	.0091,095	.0104,109	.0117,123	.0130,137	95	.0078,082	.0091,095	.0104,109	.0117,123	.0130,137	95
46	.0037,808	.0044,009	.0050,411	.0056,712	.0063,013	46	.0078,904	.0092,054	.0105,205	.0118,356	.0131,506	96	.0078,904	.0092,054	.0105,205	.0118,356	.0131,506	96
47	.0038,630	.0045,068	.0051,506	.0057,945	.0064,383	47	.0079,726	.0093,013	.0106,301	.0119,589	.0132,876	97	.0079,726	.0093,013	.0106,301	.0119,589	.0132,876	97
48	.0039,452	.0046,027	.0052,602	.0059,178	.0065,753	48	.0080,547	.0093,972	.0107,397	.0120,821	.0134,246	98	.0080,547	.0093,972	.0107,397	.0120,821	.0134,246	98
49	.0040,274	.0046,986	.0053,698	.0060,411	.0067,123	49	.0081,369	.0094,931	.0108,493	.0122,054	.0135,616	99	.0081,369	.0094,931	.0108,493	.0122,054	.0135,616	99
50	.0041,095	.0047,945	.0054,794	.0061,643	.0068,493	50	.0082,191	.0095,890	.0109,589	.0123,287	.0136,986	100	.0082,191	.0095,890	.0109,589	.0123,287	.0136,986	100

INTEREST.

A Table of Simple Interest.

The Interest of One Pound for a Number of Years.

Years.	At 3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	Years.
1	.03	.035	.04	.045	.05	1
2	.06	.07	.08	.09	.1	2
3	.09	.105	.12	.135	.15	3
4	.12	.14	.16	.18	.2	4
5	.15	.175	.2	.225	.25	5
6	.18	.21	.24	.27	.3	6
7	.21	.245	.28	.315	.35	7
8	.24	.28	.32	.36	.4	8
9	.27	.315	.36	.405	.45	9
10	.3	.35	.4	.45	.5	10
11	.33	.385	.44	.495	.55	11
12	.36	.42	.48	.54	.6	12
13	.39	.455	.52	.585	.65	13
14	.42	.49	.56	.63	.7	14
15	.45	.525	.6	.675	.75	15
16	.48	.56	.64	.72	.8	16
17	.51	.595	.68	.765	.85	17
18	.54	.63	.72	.81	.9	18
19	.57	.665	.76	.855	.95	19
20	.6	.7	.8	.9	1.	20
21	.63	.735	.84	.945	1.05	21
22	.66	.77	.88	.99	1.1	22
23	.69	.805	.92	1.035	1.15	23
24	.72	.84	.96	1.08	1.2	24
25	.75	.875	1.	1.125	1.25	25

The Use of the preceding Table.—When the interest of any sum of money is required for any number of days, look in the table for the number of days, and even with that number, under the given rate of interest, will be found the interest of one pound, for that time, and at that rate; which interest, so found, being multiplied by the principal sum, the product answers the question.

Example.—What is the interest of 462*l.* for 85 days, at 5 per cent. per annum?

In the table, even with 85 days, and under 5 per cent., you find the interest of 1*l.* to be .0116,438.

Which multiplied by the principal 462, the product will be 5*l.* 7*s.* 7*d.*

N.B. If the principal sums contain shillings and pence, you must reduce them into decimal parts, and multiply accordingly.

When the interest of any sum is required for a number of years and days together, as it frequently happens upon paying off a bond or mortgage, add the interest of one pound for the years at the end of the foregoing table, to the interest of one pound for the odd days; multiply that by the principal sum, and the product will answer the question.

By the assistance of the following table the interest of any sum of money may be obtained, from a million to a pound, for any number of days, at any rate of interest.

N ^o .	£.	s.	d.	q.	N ^o .	£.	s.	d.	q.
1000000	2739	14	6	0.99	1000	2	14	9	2.14
900000	2465	15	0	3.29	900	2	9	3	3.12
800000	2191	15	7	1.59	800	2	3	10	0.17
700000	1917	16	1	3.89	700	1	18	4	1.10
600000	1643	16	8	2.19	600	1	12	10	2.80
500000	1369	17	3	0.49	500	1	7	5	3.70
400000	1095	17	9	2.95	400	1	1	11	0.50
300000	821	18	4	1.09	300	0	16	5	1.43
200000	574	18	10	3.40	200	0	10	11	2.30
100000	273	19	5	1.70	100	0	5	5	3.15
90000	246	11	6	0.96	90	0	4	11	0.71
80000	219	3	6	0.96	80	0	4	4	2.41
70000	191	15	7	1.59	70	0	3	10	0.11
60000	164	7	8	0.22	60	0	3	3	1.81
50000	136	19	8	2.85	50	0	2	8	6.51
40000	109	11	9	1.48	40	0	2	2	1.21
30000	82	3	10	0.11	30	0	1	7	2.90
20000	54	15	10	2.74	20	0	1	1	0.60
10000	27	7	11	1.37	10	0	0	6	2.30
9000	24	13	1	3.23	9	0	0	5	3.67
8000	21	18	4	1.10	8	0	0	5	1.40
7000	19	3	6	2.96	7	0	0	4	2.41
6000	16	8	9	0.82	6	0	0	3	3.76
5000	13	13	11	2.58	5	0	0	3	1.15
4000	10	19	2	0.55	4	0	0	2	2.52
3000	8	4	4	2.41	3	0	0	1	3.80
2000	5	9	7	0.27	2	0	0	1	1.26
1000	2	14	9	2.14	1	0	0	0	2.63

Multiply the sum by the number of days, and the product thereof by the rate of interest *per cent.* then cut off the two last figures to the right hand, and enter the table with what remains to the left; against which numbers collected, you have the interest for the given sum.

Example.—What is the interest of 100*l.* at 5*l.* per cent. for 365 days?

N ^o .	£.	s.	d.	q.
N ^o . of days 365				
Mult. by 100				
Product - 36500	800	-	2	3 10 0.11
Mult. by 5 rate per cent.	20	-	0	1. 1 0.60
182500	5	-	0	0 3 1.15
1825	Ans.	5	0	0 0.00

the interest required. See Smart's Tables. Ferguson's Tracts, &c. For the method of calculating annuities, see ANNUITIES.

INTEREST *Compound*, is that which is counted both from the principal, and the simple interest forborn; called also *interest upon interest*.

Compound interest arises from the principal and its interest put together, as that interest becomes due. To find this, it is necessary to find the new principal, which is still created by the increase of the growing money, at the several times when the payments of interest were due.

Although it be not lawful to lend money at compound interest, yet in purchasing annuities, pensions, reversions, &c., it is usual to allow compound interest to the purchaser for his ready money; and, therefore, it is very necessary to understand this subject. Let *p*, *r*, *n*, and *m*, be as before; and

INTEREST.

and let it be required to find m the amount of the sum p in n years at the rate r . Now, supposing the amount of 1*l.* in one year to be $1 + r$, the amount of the same sum in two years will be $1 + r$; for $1 : 1 + r = 1 + r : 1 + r$. In like manner $1 : 1 + r = 1 + r : 1 + r$; the amount of 1*l.* in three years, and the amount of 1*l.* by the same rule in n years will be $1 + r^n$. Consequently the amount m of the sum p in n years will be $p \cdot 1 + r^n$. From this equation

$$\text{we have } p = \frac{m}{1 + r^n} \dots n = \frac{\log. m - \log. p}{\log. 1 + r}, \text{ and } r = \left(\frac{m}{p} \right)^{\frac{1}{n}} - 1.$$

Example 1.—Let $p = 50$. . . $1 + r = 1.04$. . . $n = 30$, then will m (the amount of 50*l.* in 30 years at 4*l.* per cent.) be $50 \times 1.04^{30} = 162*l.* 17.$

Ex. 2.—Let $m = 162*l.* 17.$. . . $n = 30$ ($1 + r = 1.04$), the sum p will then be $\frac{162.17}{1.04^{30}} = 50.$

Ex. 3.—Let m , p , and r be respectively equal to 162.17 . . . 50 . . . and .04, then will n be $= \frac{2.2099705 - 1.6989700}{.0170333} = 30.$

Ex. 4.—Let m , p , and n be respectively equal to 162.17 . . . 50 . . . and 30, and r will be equal to $\frac{162.17}{50}^{\frac{1}{30}} - 1 = .04.$

As the amount of 1*l.* in n years is $1 + r^n$, the amount of the same sum in $n - 1$ years will be $1 + r^{n-1}$, in $n - 2$ years $1 + r^{n-2}$, &c.; therefore, if 1*l.* be the amount at the end of the first year, the series $1 + 1 + r + 1 + r^2 + \dots + 1 + r^{n-1}$ will express the amount of 1*l.* per annum in n years, which may easily be found $= \frac{1 + r^n - 1}{r}$, and m (the amount of the annual sum a) will be $= \frac{a \cdot 1 + r^n - 1}{r}$, hence a will be $= \frac{m r}{1 + r^n - 1}$, and $n = \frac{\log. m r + a - \log. a}{\log. 1 + r}$.

In order to find the value of r , let the binomial $1 + r$ be expanded, &c., and $\frac{m}{a n}$ will be $= 1 + \frac{n-1}{2} r + \frac{n-1 \cdot n-2}{2 \cdot 3} r^2 + \&c.$ and $\frac{m}{a n} - 1 = \frac{n-1}{2} r + \frac{n-1 \cdot n-2}{2 \cdot 3} r^2 + \&c.$ Put $\frac{m}{a n} - 1 = c$, and $\frac{6}{n+1} = b$, then will r be $= \sqrt[n]{b c + 2 b c^2 - b}.$

Example 1.—If $a = 10$. . . $n = 10$. . . $1 + r = 1.04$, m will be $= \frac{1.04^{10} - 1}{.04} = 120.06*l.*$

Ex. 2.—Let n and $1 + r$ be the same as above, and $m = 120.06$, then will $a = \frac{120.06 \times .04}{1.04^{10} - 1} = 10.$

Ex. 3.—Putting $1 + r$ and $m = 120.06$ respectively, and $a = 10$, n will be $= \frac{1.170333 - 1}{.0170333} = 10.$

Ex. 4.—Retaining the same values of m and a as in the preceding example, and putting $n = 10$, $c \left(= \frac{120.06}{100} - 1 \right)$ will be $= .04146$, $b \left(= \frac{6}{11} \right)$ will be $= .5454$, and $r \left(= \sqrt[10]{.29751 + .04523} - .5454 = .5854 - .5454 \right)$ will be $= .04.$

Since $1 + r$ is the amount of 1*l.* in one year, the converse of this expression, or $\frac{1}{1 + r}$ will be the discount of 1*l.* for the same time; for if $1 + r$ to be received at the end of a year is of the same value with the present payment of 1*l.* by the rule of proportion 1*l.* to be received at the end of a year will be of the same value with $\frac{1}{1 + r}$ now received, that is, $1 + r : 1 = 1 : \frac{1}{1 + r}$. By the same reason-

ing $1 + r : 1 = \frac{1}{1 + r} : \frac{1}{1 + r}$, the value of 1*l.* to be received at the end of two years, and hence $\frac{1}{1 + r^2}$ will be the present value of 1*l.* to be received at the end of n years, the value of the sum a , therefore, to be received at the end of n years will be $\frac{a}{1 + r^n} = \pi$; from this equation the value of a will be found $= \pi \cdot 1 + r^n$, the value of $n = \frac{\log. a - \log. \pi}{\log. 1 + r}$, and the value of $r = \left(\frac{a}{\pi} \right)^{\frac{1}{n}} - 1.$

Example 1.—Let a be $= 20$. . . $n = 40$. . . $1 + r = 1.06$, and $\pi = \frac{20}{1.06^{40}} = 1.944.$

Ex. 2.—If $\pi = 1.944$, $1 + r = 1.06$, and $n = 40$, $a \left(= 1.06^{40} \times 1.944 \right)$ will be $= 20.$

Ex. 3.—Retaining the values of π and $1 + r$, and putting $a = 20$, n will be $\frac{1.30103 - .2887856}{.0253059} = 40.$

Ex. 4.—If $\pi = 1.944$. . . $a = 20$, and $n = 40$, $r \left(= \frac{20}{1.944}^{\frac{1}{40}} - 1 \right)$ will be $= .06.$

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The value of 1 l., payable at the end of n years, being $\frac{1}{1+r} \cdot \frac{1}{1+r} \dots \frac{1}{1+r}$, its value at the end of $n-1$ years will be $\frac{1}{1+r} \cdot \frac{1}{1+r} \dots \frac{1}{1+r}$, at the end of $n-2$ years $= \frac{1}{1+r} \cdot \frac{1}{1+r} \dots \frac{1}{1+r}$, and so on. It follows, therefore, that the present value of the annual payment of a for n years will be expressed by the series $\frac{a}{1+r} + \frac{a}{1+r} \cdot \frac{1}{1+r} + \frac{a}{1+r} \cdot \frac{1}{1+r} \cdot \frac{1}{1+r} \dots + \frac{a}{1+r} \cdot \frac{1}{1+r} \cdot \frac{1}{1+r} \cdot \frac{1}{1+r} \dots \frac{1}{1+r} = \frac{a}{r} - \frac{a}{r \cdot (1+r)^n}$; which, therefore, is given when a , n , and r are given. If p , n , r are given, the value of a will be obtained, being $= \frac{p \cdot r \cdot (1+r)^n}{1+r - 1}$. If a , r , p are given, the value of n will be obtained, being $= \frac{\log. a - \log. a - p \cdot r}{\log. 1+r}$. In order to find the value of r , when a , p , n are given, let the binomial $1+r$ in the equation $\frac{a}{r} - \frac{a}{r \cdot (1+r)^n} = p$, be expanded, &c., and we shall have $\frac{p}{na} = 1 - \frac{n+1}{2} r + \frac{n+1 \cdot n+2}{2 \cdot 3} r^2$, &c.; consequently $\left[\frac{p}{na} \right]^{\frac{2}{n+1}} = \frac{na}{p} \left[\frac{p}{na} \right]^{\frac{2}{n+1}}$ will be $= 1 - \frac{n+1}{2} r + \frac{n+1 \cdot n+2}{2 \cdot 3} r^2$, &c. $\left[\frac{p}{na} \right]^{\frac{2}{n+1}} = 1 + r - \frac{n-1}{12} r^2$ nearly. Let $\left[\frac{p}{na} \right]^{\frac{2}{n+1}} - 1 = d$, and $\frac{6}{n-1} = b$, then will r be $= b + \sqrt{bb - 2bd}$.

Example 1.—Supposing a , n , r to be respectively equal to 10, 21, and .05, then will p be $= \frac{10}{.05} - \frac{10}{.05 \times 1.05^{21}} = 200 - 71.79 = 128.21$.

Example 2.—Let n , r , and p be respectively equal to 21, .05, and 128.21, then will a be $= \frac{.05 \times 105^{21}}{1.05^{21} - 1} = \frac{.1393 \times 128.21}{1.78} = 10$.

Example 3.—The quantities r and p being still the same and a being equal 10, n will be $= \frac{1 - .5150340}{.0211893} = 21$.

Example 4.— a , p , n being respectively equal to 10, 128.21, and 21, r will be equal to $\frac{6}{20} - \sqrt{.06246} = .3 - .25 = .05$.

The following twelve cases, though they do not so frequently occur in practice as the preceding, may not improperly be added here. Let a , as before, be the annuity, n the number of years, m the amount of the annuity in n years, p its value for the same time, and r the rate of interest.

Case 1.— m , p , a being given to find r . In the foregoing cases m being $= \frac{a \cdot (1+r)^n - 1}{r}$, and $p = \frac{a \cdot (1+r)^n - 1}{r \cdot (1+r)^n}$, therefore will be $= \frac{1}{1+r}$, and $p = \frac{m}{1+r}$, from which r will be found $= \frac{m - p \cdot a}{m \cdot p}$.

Case 2.— n , m , p being given to find r . Since $\frac{m}{p} = \frac{1}{1+r}$, the $\log. 1+r$ will be $= \frac{\log. m - \log. p}{n}$, hence $1+r$, and consequently r , will be known.

Case 3.— m , r , p being given to find n . This is derived from the preceding case, being $= \frac{\log. m - \log. p}{\log. 1+r}$.

Case 4.— a , m , p being given to find n . $\frac{1}{1+r}$ being $= \frac{m}{p}$, $\frac{1}{1+r} - 1$ will be known; and since r is $= \frac{a \cdot (1+r)^n - 1}{m}$, r will also be known, therefore, since $\log. 1+r$ is $= n \times \log. 1+r$, n will be known, being $= \frac{\log. 1+r}{\log. 1+r}$.

Case 5.— a , r , p being given to find m . By *Case 1*, m may be easily found $= \frac{a \cdot p}{a - p \cdot r}$.

Case 6.— a , n , p being given to find m . The value of r may be derived from one of the foregoing theorems, in which a , p , n are given (being $= b \pm \sqrt{bb - 2bd}$), and hence $m = p \cdot (1+r)^n$ will also be given.

Case 7.— n , r , p being given to find m . As r is given, this value is immediately obtained from the preceding case, being $= p \cdot (1+r)^n$.

Case 8.— m , r , a being given to find p . By *Case 1*, r is $= \frac{m - p \cdot a}{m \cdot p}$, therefore $p = \frac{a \cdot m}{a + m \cdot r}$.

Case 9.— n , m , r being given to find p . Since $\frac{m}{p} = \frac{1}{1+r}$, p will be $= \frac{m}{1+r}$.

Case 10.— n , m , a being given to find p . Let the value of r be found when m , n , a are given by one of the preceding theorems (being $= \sqrt{bb + 2bc - b}$), and $p = \frac{m}{1+r}$, will then be given.

Case 11.— n , m , p being given to find a . Since $\frac{m}{p} = \frac{1}{1+r}$, r will be $= \left[\frac{m}{p} \right]^{\frac{1}{n}} - 1$, and consequently given; therefore the value of a may be found from the equation $m = \frac{a \cdot (1+r)^n - 1}{r}$ to be $= \frac{m \cdot r}{1 + r^n - 1}$.

Case 12.— m , p , r being given to find a . Let $\frac{m}{p}$ be substituted for its equal $\frac{1}{1+r}$ in the expression $\frac{m \cdot r}{1 + r^n - 1}$, and

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and a will be $= \frac{m r}{p - 1} = \frac{m p r}{m - p}$.

Dr. Maskelyne, in his introduction to Taylor's logarithms, has, with the view of facilitating these operations, had recourse to the tables of logarithmic sines and tangents, by putting $r = t^2$. $A, 1 + r = \sec^2 A, 1 + r^2 = \sec^2 A$, $B, \&c.$; thus, in *Case 1*, the value of r becomes $= \frac{a}{m} \times$

t^2 . B ; for $\frac{m}{p}$ being $= \frac{1}{1 + r^2} = \sec^2 B$, and $\frac{\frac{m}{p} - 1}{r} \times a$
 $= \frac{\sec^2 B - 1}{r} \times a = \frac{t^2 \cdot B}{r} \times a, r \left(= \frac{m - p}{m p} \right)$ will be
 $= \frac{t^2 \cdot B}{m} \times a$. In like manner, in *Case 12*, $a = \frac{m r}{1 + r^2 - 1}$

becomes $= \frac{m r}{\sec^2 B - 1} = \frac{m r}{t^2 \cdot B} = m r \times \cot - t^2 \cdot B$,
 or $m \cdot t^2 \cdot A \times \cot - t^2 \cdot B$. But though the expressions appear more simple, I do not know that in general the operations will be found to be much facilitated by these means.

In the preceding cases money has been supposed to be improved or discounted yearly. But all these different theorems may, however, be applied to the solution of cases which require money to be improved or discounted at shorter intervals. Thus, supposing it were required to determine the amount of 50*l.*, when laid out half yearly, to accumulate at 4*l. per cent.* for the term of 30 years: p is $= 50$, $n = 2 \times 30 = 60$, r the interest of 1*l.* for half a year $= .02$, and $m = p \cdot \frac{1}{1 + r^n}$ becomes $= 50 \times \frac{1}{1.02^{60}} = 164.05$. If improved quarterly it will be $= 50 \times \frac{1}{1.01^{120}} = 165$.

Again, if it were required to determine the amount of 5*l.* laid out half yearly, to be improved at 4*l. per cent.* during a term of 10 years. In this case $m = \frac{a \times \frac{1}{1 + r^n} - 1}{r}$ will

be $= \frac{5 \times \frac{1}{1.02^{2 \times 10}} - 1}{.02} = 121.486$, and if it be improved quarterly, it will be $= \frac{5 \times \frac{1}{1.01^{4 \times 10}} - 1}{.01} = 122.2$.

In like manner, if money be discounted at shorter intervals than a year, the present value will be obtained from the expression

$\frac{1}{1 + r^n}$; thus, let the present value be required of 20*l.* payable at the end of 40 years, supposing money to be discounted every half year at 6*l. per cent.* Here n becomes $= 2 \times 40 = 80$, $r = \frac{.06}{2} = .03$, and consequently $\pi = \frac{a}{1 + r^n} =$

$\frac{20}{1.03^{80}} = 1.8795$.

Let k be any fraction of a year in which money is to be improved or discounted, and the amount or present value may always be found from the amount or present value when money is improved or discounted yearly, being the same with such amount or value at $\frac{r}{k}$ interest for $k n$ years. Thus, the

amount of 50*l.* improved half yearly at 4*l. per cent.* for 30 years is the same with the amount of 50*l.* improved yearly for 60 years at 2*l. per cent.*; the amount of 5*l. per ann.* im-

proved half yearly for 10 years at 4*l. per cent.*, is the same with the amount of 5*l. per ann.* improved yearly for 20 years at 2*l. per cent.*; and 10*l.* discounted half yearly for 40 years at 6*l. per cent.* is the same with 10*l.* discounted yearly for 80 years at 3*l. per cent.* The different values of annuities, when payable yearly, half yearly, quarterly, or at shorter intervals, may in the same manner be deduced from the preceding theorems, but these are explained in the article ANNUITIES.

M. De Moivre, M. D'Alembert, and some others, instead of making the interest of 1*l.* for the k th part of a year $= \frac{r}{k}$,

have chosen to make it $= \frac{1}{1 + r^{\frac{1}{k}}} - 1$, and hence the amount of 1*l.* in n years, or its present value at the end of n years, will be the same, whether money be improved or discounted yearly, or at shorter intervals. But the amount of 1*l. per ann.* will be to its amount when improved yearly in the constant ratio of r to $k \times \frac{1}{1 + r^{\frac{1}{k}}} - 1$, and the value of an annuity of 1*l.* will be to its value, when paid yearly, inversely as r to $k \cdot \frac{1}{1 + r^{\frac{1}{k}}} - 1$, whatever the length of the term during which the money is to accumulate, or the annuity is to continue. Now, it is well known that the difference between the values of annuities payable yearly, and their values, when payable half-yearly, quarterly, or at shorter intervals, is always lessened as the term is extended, so that if the annuity be perpetual, the values will be the same, whether the payments are made yearly, or in any fractional part of the year; which can never be the case on the supposition above mentioned. When n is

$= \log. \frac{r}{r - k \cdot \frac{1}{1 + r^{\frac{1}{k}}} - 1} \div \log. 1 + r$, an annuity pay-

able every k th part of the year, will be equal to the perpetuity, so that an annuity payable half-yearly, at 5*l. per cent.* for 90½ years, or quarterly for 80 years, will be equal to the same annuity payable yearly for ever. And at 6*l. per cent.* the annuities will be of equal value if the term be only 72½ years in the one case, or 65½ years in the other. But while these rules, when the term is very long, give the values of annuities payable at shorter intervals than a year too high, they always, on the contrary, and especially when the term is very long, give the amount of a sum much too low. Thus supposing one penny to be laid out at 5*l. per cent.* compound interest at the birth of our Saviour, or 1810 years ago, it will accumulate, when money is improved yearly, to a sum which is equal to 381,860,000 globes of solid gold, each equal to the earth in magnitude. When improved half-yearly, to a sum which is equal to 1,121,470,000 of such globes, and when improved quarterly, to a sum which is equal to 1,945,680,000 such globes; so that although in this long time the accumulation is nearly three times greater when money is improved half-yearly, and more than five times greater when improved quarterly than it is when money is improved yearly, yet according to the supposition that

$\frac{1}{1 + r^{\frac{1}{k}}}$ is the amount of 1*l.* in the k th part of a year, or $\frac{1}{1 + r^{\frac{1}{k}}} =$ its amount in n years, its accumulation will be the same, whether money is improved yearly, half-yearly, or quarterly. It may easily be shewn that $\frac{1}{1 + r^{\frac{1}{k}}} - 1$ is always less than $\frac{r}{k}$, or, in other words, that this expression

does not give the full interest of 1*l.* for the k th part of a year. It is no wonder, therefore, that any theorems derived from a principle so erroneous, should, like the preceding, lead to conclusions which are not only incorrect but absurd.

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To the foregoing, a great number of other cases might be added. But it will be sufficient to give only a few of the most curious and important; some of which having occurred in practice, it would perhaps be improper to omit them.

Theorem 1.—To determine the time in which *il.* will be doubled by compound interest.

Solution.—Since $(1 + r)^n$ the amount of *il.* at the end of *n* years is in this case = $2n$, or the required time, will be $\frac{\log. 2}{\log. 1 + r}$; from which it appears that money doubles

itself at *3l. per cent.* in $23\frac{1}{2}$ years nearly; at *4l. per cent.* in $17\frac{3}{4}$ years; at *5l. per cent.* in $14\frac{1}{5}$ years; at *6l. per cent.* in $11\frac{9}{10}$ years; at *8l. per cent.* in 9 years; at *10l. per cent.* in $7\frac{1}{4}$ years; and at *12l. per cent.* in $6\frac{1}{6}$ years nearly.

Theorem 2.—Supposing money to be doubled by compound interest in *n* years, required *r* the rate of interest at which it has been improved.

Solution.—The $\log. 1 + r$, by the preceding theorem being given = $\frac{\log. 2}{n}$, the value of *r* will also be given. Or, if the hyperbolic logarithm of 2 be expressed by *b*, it will be found = $1 - \frac{\sqrt[n]{n-2} \cdot b}{\sqrt[n]{n}}$.

Theorem 3.—Supposing *il.* to be doubled in *n* years at the interest *r*, and in *m* years at the interest $2r$, to find the ratio of *m* to *n*.

Solution.—Since $(1 + r)^n$ and $(1 + 2r)^m$ are each of them equal to 2, they will be equal to each other, and consequently *m* will be to *n* as $\log. 1 + r$ to $\log. 1 + 2r$, or by fluxions and the binomial theorem, as $\frac{1}{2} + \frac{1-r \cdot r}{4}$ to one very nearly, or still more nearly, as $\frac{1}{2} + \frac{1-r \cdot r}{4} + \frac{7-9r \cdot r^3}{24}$ to one.

Examples.—At 3 and 6 *per cent.* *m* and *n* are respectively to each other in the ratio of .50746 to one; at 4 and 8 *per cent.* of .50934 to one; at 5 and 10 *per cent.* of .51197 to one; at 6 and 12 *per cent.* of .51417 to one; at 8 and 16 *per cent.* of .51889 to one; at 10 and 20 *per cent.* of .52269 to one; and at 12 and 24 *per cent.* of .52681 to one. From these examples it appears that the higher the interest the greater will be the ratio of *m* to *n*. It follows also from the expression

$\frac{1}{2} + \frac{1-r \cdot r}{4}$, &c. that money will not double itself at $2r$ interest in half the time that it doubles itself at *r* interest. The truth of this conclusion may perhaps be more satisfactorily proved in the following manner. Since $m : n = \log. 1 + r : \log. 1 + 2r = \log. 1 + r : \log. 1 + r + \log. 1 + \frac{r}{r+1}$, we shall have $m : n = 1 : 1 + \frac{r}{r+1}$. But this latter fraction must be less than unity, therefore *m* will always be to *n* in a greater ratio than as 1 to 2.

Theorem 4.—To determine the sum to which an annuity *a* will accumulate at the end of *n* years, supposing such

annuity to be received annually, and its interest to be improved *half-yearly*.

Solution.—The series expressing these accumulations is

$$a \left(\left(1 + \frac{r}{2} \right)^1 + \left(1 + \frac{r}{2} \right)^2 + \left(1 + \frac{r}{2} \right)^3 + \dots + \left(1 + \frac{r}{2} \right)^{2n} \right) = a \times \frac{\left(1 + \frac{r}{2} \right)^{2n} - 1}{\left(1 + \frac{r}{2} \right) - 1}$$

Example.—Let *a* = 500, *n* = 30, and *r* = .05, the foregoing expression will then be $\frac{1.025^{60} - 1}{1.025 - 1} \times 500 =$

$67.1567 \times 500 = 33,578.35$. If the above annuity and its interest be improved yearly, the accumulation will be equal to 33,219.4*l.* and if both principal and interest be improved half-yearly, they will amount to 33,998*l.*

Theorem 5.—To determine the sum *p* which at compound interest will amount in the time *n* to *N*, and in the time *m* to *M*.

Solution.—In this case $p \cdot (1 + r)^n = N$, and $p \cdot (1 + r)^m = M$, from which two equations, the $\log.$ of *p* may be found = $\frac{m \cdot \log. N - n \cdot \log. M}{m - n}$.

Corollary 1.—If the sum *p* amounts to *N* in the time *n*, the $\log.$ of the amount *M* in the time *m* will be = $\frac{m \cdot \log. N - m - n \cdot \log. p}{n}$.

Corollary 2.—If the sum *p* in *n* years amounts to *N*, the time *m* in which it will amount to *M*, will be = $\frac{n \cdot \log. N - \log. p}{\log. M - \log. p}$.

Theorem 6.—Supposing the sum *a* to become payable annually for *n* years, at what time *t* might all the payments (*n a*) be made at once, so as to be an equivalent to the several annual payments.

Solution.—The present value of the annuity *a* for *n* years (see ANNUITIES) being = $\frac{a}{r} - \frac{a}{r \cdot (1 + r)^n}$, will in this

case be = $\frac{n a}{1 + r}$, from which equation *t* may be found = $\frac{\log. n r + \log. (1 + r)^n - \log. (1 + r)^t - 1}{\log. 1 + r}$.

Example.—Let *a* = 10, *n* = 15, and *r* = .05, or, in other words, let an annuity of 10*l.* be payable annually for 15 years at 5*l. per cent.* at what period will the single payment of 150*l.* be an equivalent to this annuity? In this case *t* will be =

$$\log. .5 + \log. \frac{1.05^{15} - \log. 1.05^{15} - 1}{\log. 1.05} = 7.5$$

nearly, or $7\frac{1}{2}$ years. By the same rule, if the annuity were for 30 or 50 years, a single payment made at the end of 13.7 years, or at the end of $20\frac{1}{2}$ years, will be an equivalent to such annuities respectively.

Corollary.—If the payments, instead of always being *a*, vary each year, so that in the first, second, and third years

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they are $a, b, c, d, &c.$ respectively, and the whole amount of them be p , the time t will be =

$$\log. p - \log. \left(\frac{a}{1+r} + \frac{b}{1+r^2} + \frac{c}{1+r^3} + \&c. \right) \div \log. 1+r$$

Theorem 7.—Supposing the sum b to be now borrowed on condition that the annuity c should be paid in discharge of it, after the expiration of n years; for how many years t should such annuity be continued from that time so as to be an equivalent to the sum so advanced?

Solution.—The amount of b in n years being $b \cdot \overline{1+r}^n$, and the value of the annuity c for t years being $\frac{c \cdot \overline{1+r}^t - c}{r \cdot \overline{1+r}^t}$, these two expressions, by the condition of the problem, will be equal to each other. Let

$\frac{c \cdot \overline{1+r}^t - c}{r \cdot \overline{1+r}^t}$ be denoted by d , then may t be easily found = $\frac{\log. d}{\log. 1+r}$. Thus, if $b = 1032 \dots c = 400 \dots n = 37 \dots$ and $r = .05$, d will be =

$\frac{400 - .05 \times 1032 \times 6.081}{\log. \text{ of } 1.05} = 46.4$, and $t = \frac{\log. \text{ of } 46.4}{\log. \text{ of } 1.05} = 31.4$, that is, if 1032*l.* be now borrowed on condition that the debt should be discharged at the end of 37 years by an annual payment of 400*l.* such payment, computing at 5*l. per cent.* should be continued for 31½ years.

Corollary.—If c be = $\overline{1+r}^n \times br$, the annual payment must be continued for ever; if c be less than $br \times \overline{1+r}^n$, the debt can never be repaid.

From any four of the above quantities being given the fifth may be obtained without much difficulty. But it cannot be necessary to pursue this subject further, as the solution of these or any other cases in compound interest may be easily derived from the principles already explained in this article.

See on this subject, Jones's Synopsis Palmariorum Mathematicos, part. i. sect. 3. chap. 10. Gardiner's Tables of Logarithms, p. 13. 3d edition. Philos. Transactions, vol. ix. p. 508. and vol. lxvi. p. 109. Taylor's Tables of Logarithms, p. 30; and Mazere's Scriptorum Logarithmici, vol. v. p. 220. See also ANNUITIES Certain, and DISCOUNT.

A mercantile friend has favoured the editor with the following *universal* rule for finding the interest upon *any* sum at *any* rate, for *any* number of days.

Multiply the *sum* by the *rate* of interest, and multiply that product by the *number* of days; then divide that product by 36500. The quotient will be the answer.

Now suppose the question to be, What is the interest upon 127*l.* at 3*l. per cent. per annum* for 254 days?

£.	£.
127	at 3 for 254 days.
3	Rate of interest,
<hr/>	
381	First product.
254	Days.
<hr/>	
1524	
1705	
762	
<hr/>	
36500	£. s. d.
96774	(2 13 0½ Answer.

36500)96774(2*l.* 13*s.* 0½*d.* Brought over.

73000
23774
20 Shillings.

475480(13
36500

110480
109500

980
12 Pence.

11760(0
4 Farthings.

47040(1
36500

10540 Remainder.

It is evident, that in multiplying 127 by 3, according to the *first* operation of the rule, the amount is *increased* one hundred times too much, for the product 381 is only three, and eighty-one hundredths, or 381*l.* which is equal to 3*l.* 16*s.* 2½*d.* or the interest of 127*l.* at 3 *per cent.* for one year. Therefore, to correct this *first* error, the product 381 must be divided by 100, and it will be right.

But in following the rule, the *first* error is *continued*, and we go on to multiply that product by the number of days, by which it is also evident that the product 96774 includes a *second* error of 365 times too much, being for *days* instead of for *years*, and the amount of the *two* errors taken together is 100 times 365 times too much, or 36,500 times too much, therefore, to bring it right, it must be divided by that number.

This explains the principle of the first universal rule, which requires *three* operations, *because* it is adapted to *any* rate of interest whatever.

To find the interest upon any sum at 5 *per cent.* for any number of days:

Rule.—Multiply the sum by the number of days, and divide the product by 7300.

Example.

What is the interest upon 2745*l.* for 365 days?

365	
13725	
16470	
8235	£. s. d.
7300	1001925(137 5 0
7300	
<hr/>	
27192	
21900	
<hr/>	
52925	
51100	
<hr/>	
1825	
20	
<hr/>	
36500	(5
36500	

Interest

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Interest at 5 per cent. being the most common rate in Great Britain, may in general be worked as speedily by the above short rule as it can be found by referring to the tables in common use.

The editor's correspondent has never yet met with so short a rule as this, and as 5 per cent. is the general and legal rate of interest in this country, it must be very useful to mercantile persons.

The explanation of the principle of the first rule being understood as above, there can be no difficulty in the last rule, it being derived from it.

When the interest is at any other rate, take the following rule:

Multiply the sum by the number of days; multiply that product by the rate of interest, then divide by 36500.

Example.

What is the interest upon 1612l. for 154 days at 4 per cent.?

$$\begin{array}{r}
 154 \\
 \times 1612 \\
 \hline
 9060 \\
 16120 \\
 \hline
 248248 \\
 \times 4 \\
 \hline
 992992 \\
 36500 \overline{) 992992} \quad (27 \ 4 \ 1\frac{1}{2} \\
 \underline{73000} \\
 262992 \\
 \underline{255500} \\
 7492 \\
 20 \\
 \hline
 149840(4 \\
 \underline{146000} \\
 3840 \\
 12 \\
 \hline
 46080(1 \\
 \underline{36500} \\
 9580 \\
 4 \\
 \hline
 38320(1 \\
 \underline{36500} \\
 1820
 \end{array}$$

If the rate of interest is not in even pounds, such as $2\frac{1}{2}$, $3\frac{1}{2}$, or $4\frac{1}{2}$ per cent. take the following rule:

Multiply the sum by the number of days; multiply the product by double the rate of interest, then divide by 73000.

Example :—What is the interest upon 2746l. for 328 days at $3\frac{1}{2}$ per cent.?

$$\begin{array}{r}
 2746 \\
 \times 328 \\
 \hline
 5492 \\
 54920 \\
 \hline
 900688 \\
 7 \\
 \hline
 6304816(86 \ 7 \ 4 \\
 73000 \overline{) 6304816}
 \end{array}$$

73000)6304816(86l. 7s. 4d. Brought over.

$$\begin{array}{r}
 584000 \\
 \hline
 464816 \\
 438000 \\
 \hline
 26816 \\
 20 \\
 \hline
 536320(7 \\
 \underline{511000} \\
 25320 \\
 12 \\
 \hline
 303840(4 \\
 \underline{292000} \\
 11840
 \end{array}$$

Any calculation made by the second rule may be proved by the third rule, and *vice versa*. Therefore every calculation of interest at any rate whatever, may be made by either of those rules. When an interest account of considerable length is required to be made out, it may be done as much sooner by this method than it can be done by any interest tables whatever, as there are different lines to be cast.

By the following table of rules, interest upon any sum for any number of days at the several rates of $\frac{1}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{4}$, 2, $2\frac{1}{2}$, 4, 5, and 10 per cent. per annum, may be cast by two operations only, namely, one multiplication and one division.

First, multiply the sum by the number of days, then divide the product by the number standing against the rate of interest, and the quotient will be the answer.

For interest at $\frac{1}{4}$ per cent. divide by 146000

$\frac{1}{4}$	-	-	73000
1	-	-	36500
$1\frac{1}{4}$	-	-	29200
2	-	-	18250
$2\frac{1}{2}$	-	-	14600
4	-	-	9125
5	-	-	7300
10	-	-	3650

The above rule may be still further shortened in practice, by cutting off one figure each from the dividend and the divisor, and in that case it will not in any instance make more than one farthing difference.

Interest is the compensation which the borrower pays to the lender, for the profit which he has an opportunity of making by the use of the money. Part of that profit naturally belongs to the borrower, who runs the risk and takes the trouble of employing it; and part to the lender, who affords him the opportunity of making this profit. Interest has been sometimes confounded with usury; and the latter term, the sound of which is odious, has been occasionally misapplied and estimated on erroneous principles. (See USURY.) Accordingly those who are enemies to interest in general, making no distinction between that and the kind of usury which is criminal, hold any increase of money to be indefensibly usurious. This they ground, as well on the prohibition of it by the law of Moses among the Jews, as also upon what is said to be laid down by Aristotle in a passage, (Polit. l. i. c. 10.) suspected to be spurious, that money is naturally barren, and that to make it breed money is preposterous, and a perversion of the end of its institution, which was only to serve the purposes of exchange, and not of increase. Hence the school divines have branded the practice of taking interest as contrary to the divine law, both

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both natural and revealed; and the canon law (Decret. l. v. tit. 19.) has procribed the taking of any, the least, increase for the loan of money as a mortal sin. But it has been observed in reply, that the Mosaic precept was clearly a political, and not a moral precept. It only prohibited the Jews from taking usury of their brethren; but, in express words, (Deut. xxiii. 20.) permitted them to take it of a stranger, which proves that the taking of moderate usury, as a reward for the use, for so the word signifies, is not *malum in se*; since it was allowed where any but an Israelite was concerned. As to the reason, deduced from the natural barrenness of money, and ascribed to Aristotle, the same may with equal force be alleged of houses, which never breed houses; and of twenty other things, which nobody doubts it is lawful to make profit of, by letting them to hire. And though money was originally used for the purposes of exchange, yet the laws of any state may be well justified in permitting it to be turned to the purposes of profit, if the convenience of society (the great end for which money was invented) shall require it. That the allowance of moderate interest tends greatly to the benefit of the public, especially in a trading country, will appear from that generally acknowledged principle, that commerce cannot subsist without mutual and extensive credit. Unless money can be borrowed, trade cannot be carried on; and if no premiums were allowed for the hire of money, few persons would care to lend it; or at least the case of borrowing at a short warning (which is the life of commerce) would be entirely at an end. Thus, in the dark ages of monkish superstition and civil tyranny, when interest was laid under a total interdict, commerce was also at its lowest ebb, and fell entirely into the hands of the Jews and Lombards: but when men's minds came to be more enlarged, when true religion and real liberty revived, commerce grew again into credit; and again introduced with itself its inseparable companion, the doctrine of loans upon interest. And, as to any scruples of conscience, since all other conveniences may either be bought or hired, but money only can be hired, there seems to be no greater oppression in taking a recompence or price for the hire of this than of any other convenience. To demand an exorbitant price is equally contrary to conscience, for the loan of a horse, or the loan of a sum of money; but a reasonable equivalent for the temporary inconvenience, which the owner may feel by the want of it, and for the hazard of his losing it entirely, is not more immoral in one case than it is in the other. Indeed, the absolute prohibition of lending upon any, even moderate interest, introduces the very inconvenience which it seems meant to remedy. The necessity of individuals will make borrowing unavoidable. Without some profit allowed by law, there will be but few lenders: and those principally bad men, who will break through the law, and take a profit; and then will endeavour to indemnify themselves from the danger of the penalty, by making that profit exorbitant. Accordingly it is well observed by Grotius, (De Jur. Bell. et Pac. l. ii. c. 12. § 22.) "if the compensation allowed by law does not exceed the proportion of the hazard run, or the want felt, by the loan, its allowance is repugnant neither to the revealed nor the natural law: but if it exceeds those bounds, it is then oppressive usury: and though the municipal laws may give it impunity, they never can make it just." The exorbitance or moderation of interest depends upon two circumstances, the inconvenience of parting with it for the present, and the hazard of losing it entirely. The rate of interest will be generally in a compound ratio, formed out of the inconvenience and the hazard.

Mr. Locke, Mr. Law, and Mr. Montesquieu, as well as

many other writers, seem to have imagined that the increase of the quantity of gold and silver, in consequence of the discovery of the Spanish West Indies, was the real cause of the lowering the rate of interest through the greater part of Europe. Those metals, they say, having become of less value than silver, the use of any particular portion of them became necessarily of less value too, and consequently the price which could be paid for it. This notion appears at first sight very plausible; but it has been contested, not to say refuted, by Mr. Hume and Dr. Smith. It is in vain, says the first of these writers, (Essays, vol. i. ess. iv.) to look for the cause of the fall or rise of interest in the greater or less quantity of gold and silver, which is fixed in any nation. High interest arises from three circumstances: A great demand for borrowing; little riches to supply that demand; and great profits arising from commerce: and these circumstances are a clear proof of the small advance of commerce and industry, not of the scarcity of gold and silver. Low interest, on the other hand, proceeds from the three opposite circumstances: a small demand for borrowing; great riches to supply that demand; and small profits arising from commerce: and these circumstances are all connected together, and proceed from the increase of industry and commerce, not of gold and silver. In investigating the causes and effects of a great or small demand for borrowing, Mr. Hume traces the origin and establishment of the *landed* interest; and he observes, after tracing the manner in which some persons become proprietors of land, and the influence of a settled revenue on those who are entirely without occupation, that the prodigals among the landholders will always be more numerous than the misers. In a state, therefore, where there is nothing but a landed interest, as there is little frugality, the borrowers must be very numerous, and the rate of interest must bear proportion to it; the difference depends not on the quantity of money, but on the habits and manners which prevail. By this alone the demand for borrowing is increased or diminished. Were money so plentiful as to make an egg be sold for sixpence; so long as there are only landed gentry and peasants in the state, the borrowers must be numerous, and interest high. The rent for the same farm would be heavier and more bulky; but the same idleness of the landlord, with the higher price of commodities, would dissipate it in the same time, and produce the same necessity and demand for borrowing. The second circumstance, above-mentioned, *viz.* the great or little riches to supply the demand, depends also on the habits and way of living of the people, not on the quantity of gold and silver. In order to have, in any state, a greater number of lenders, it is not sufficient nor requisite that there be great abundance of the precious metals. It is only requisite that the property, or command of that quantity, which is in the state, whether great or small, should be collected in particular hands, so as to form considerable sums, or compose a great *monied* interest; this begets a number of lenders, and sinks the rate of usury: and this, Mr. Hume affirms, depends not on the quantity of specie, but on particular manners and customs, which make the specie gather into separate sums or masses of considerable value. The reduction of interest must proceed from an increase of industry and frugality, of arts and commerce. Besides the peasants and the proprietors of land, there must be another rank of men, who, receiving from the former the rude materials, work them into their proper form, and retain part for their own use and subsistence. As industry increases, and the views of men enlarge, it is found that the most remote parts of the state can assist each other as well as the more contiguous, and that this intercourse of good offices may be carried on to the greatest extent and intricacy.

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tricity. Hence the origin of "Merchants," who serve as agents between different parts of the state; and in all the transactions which this business of connecting agency or merchandize occasions, it is necessary and reasonable that a considerable part of the commodities and labour should belong to the merchant, to whom, in a great measure, they are owing. These commodities he will sometimes preserve in kind, or more commonly convert into money, which is their common representation. If gold and silver have increased in the state, together with the industry, it will require a great quantity of these metals to represent a great quantity of commodities and labour. If industry alone has increased, the prices of every thing must sink, and a small quantity of specie will serve as a representative. Trade, says Mr. Hume, increases frugality, and among merchants there is the same overplus of misers above prodigals, as, among the possessors of land, there is the contrary. Commerce increases industry, as well as frugality. Merchants beget industry, and by their frugality they acquire great power over that industry, and collect a large property in the labour and commodities which they are the chief instruments in producing. Without commerce the state must consist chiefly of landed gentry, whose prodigality and expence make a continual demand for borrowing; and of peasants, who have no sums to supply that demand. The money never gathers into large stocks or sums, which can be lent at interest. Commerce alone assembles it into considerable sums; and this effect it has merely from the industry which it begets, and the frugality which it inspires, independent of that particular quantity of precious metal which may circulate in the state. Thus an increase of commerce necessarily raises a great number of lenders, and by that means produces lowness of interest. The next consideration is, that this increase of commerce diminishes the profits arising from that profession, and gives rise to the *third* circumstance, above-mentioned, requisite to produce lowness of interest. When commerce has become extensive, and employs large stocks, there must arise rivalships among the merchants, which diminish the profits of trade, at the same time that they increase the trade itself. The low profits of merchandize induce the merchants to accept more willingly of a low interest, when they leave off business, and begin to indulge themselves in ease and idleness. Low interest and low profits both arise from an extensive commerce, and mutually forward each other. No man will accept of low profits, where he can have high interest; and no man will accept of low interest, where he can have high profits. An extensive commerce, by producing large stocks, diminishes both interest and profits; and is always assisted, in its diminution of the one, by the proportional sinking of the other. Those, says our author, who have asserted, that the plenty of money was the cause of low interest, seem to have taken a collateral effect for a cause; since the same industry, which sinks the interest, commonly acquires great abundance of the precious metals. But though plenty of money and low interest naturally arise from commerce and industry, they are altogether independent of each other. As to the reduction of interest, which has taken place in England, France, and other kingdoms of Europe, that have no mines, it has been gradual; and has not proceeded, says Mr. Hume, from the increase of money, considered merely in itself; but from that of industry, which is the natural effect of the former increase, in that interval, before it raises the price of labour and provisions. Dr. Smith (*Wealth of Nations*, vol. ii. p. 39.) coincides in opinion with Mr. Hume, and proposes a very short and plain argument, which, he thinks, may serve to explain the fallacy by which those have been misled who ascribe the lowering

of the rate of interest to the increase of the quantity of gold and silver. Before the discovery of the Spanish West Indies, 10 *per cent.* seems to have been the common rate of interest through the greater part of Europe. It has since that time in different countries sunk to 6, 5, 4, and 3 *per cent.* Let us suppose that in every particular country the value of silver has sunk precisely in the same proportion as the rate of interest; and that in those countries, for example, where interest has been reduced from 10 to 5 *per cent.*, the same quantity of silver can now purchase just half the quantity of goods which it could have purchased before. This supposition will not, as Dr. Smith believes, be found any where agreeable to the truth, but it is the most favourable to the opinion now examined; and even upon this supposition it is utterly impossible that the lowering of the value of silver could have the smallest tendency to lower the rate of interest. If 100*l.* are in these countries now of no more value than 50*l.* were then, 10*l.* must now be of no more value than 5*l.* were then. Whatever were the causes which lowered the value of the capital, the same must necessarily have lowered that of the interest, and exactly in the same proportion. The proportion between the value of the capital and that of the interest must have remained the same, though the rate had never been altered. By altering the rate, on the contrary, the proportion between these two values is necessarily altered. If 100*l.* now are worth no more than 50*l.* were then, 5*l.* now can be worth no more than 2*l.* 10*s.* were then. By reducing the rate of interest, therefore, from 10 to 5 *per cent.*, we give for the use of a capital, which is supposed to be equal to one-half of its former value, an interest which is equal to one-fourth only of the value of the former interest. Any increase in the quantity of silver, while that of the commodities circulated by means of it remained the same, could have no other effect than to diminish the value of that metal. The nominal value of all sorts of goods would be greater, but their real value would be precisely the same as before. They would be exchanged for a greater number of pieces of silver, but the quantity of labour which they could command, the number of people whom they could maintain and employ, would be precisely the same. The capital of the country would be the same, though a great number of pieces might be requisite for conveying any equal portion of it from one hand to another. The funds for maintaining productive labour being the same, the demand for it would be the same. Its price, or wages, therefore, though nominally greater, would really be the same, they would be paid in a greater number of pieces of silver; but they would purchase only the same quantity of goods. The profits of stock would be the same both nominally and really. The profits of stock are not computed by the number of pieces of silver with which they are paid, but by the proportion which those pieces bear to the whole capital employed. The common proportion between capital and profit would be the same, and consequently the common interest of money; what can commonly be given for the use of money being necessarily regulated by what can commonly be made of it. The interest of money, keeping pace always with the profits of stock, might be greatly diminished, though the value of money, or the quantity of goods which any particular sum could purchase, was greatly augmented.

In countries, says our ingenious author, where interest is permitted, the law, in order to prevent the extension of usury, generally fixes the highest rate which can be taken without incurring a penalty. This rate ought always to be somewhat above the lowest market price, or the price which is commonly paid for the use of money by those who can give the most undoubted security. If this legal rate should

be fixed below the lowest market rate, the effects of this fixation must be nearly the same as those of a total prohibition of interest. The creditor will not lend his money for less than the use of it is worth, and the debtor must pay him for the risk which he runs by accepting the full value of that use. The legal rate, though it ought to be somewhat above, ought not to be much above the lowest market rate. If the legal rate of interest in Great Britain, for example, was fixed so high as 8 or 10 *per cent.*, the greater part of the money which was to be lent, would be lent to prodigals and projectors, who alone would be willing to give this high interest. Where the legal rate of interest is fixed but a very little above the lowest market rate, sober people are universally preferred, as borrowers, to prodigals and projectors. Then a great part of the capital of the country is thrown into the hands in which it is most likely to be employed with advantage. The ordinary market price of land depends every where upon the ordinary market rate of interest. If the rent of land should fall short of the interest of money by a considerable difference, nobody would buy land, which would soon reduce its ordinary price. On the contrary, if the advantages should much more than compensate the difference, every body would buy land, which would soon again raise its ordinary price. When interest was at 10 *per cent.*, land was commonly sold for 10 and 12 years' purchase. As interest sunk to 6, 5, and 4 *per cent.*, the price of land rose to 20, 25, and 30 years' purchase. As to the legal interest in this country, it has varied and decreased for 200 years past according to the accession of trade, the introduction of paper credit, and other circumstances. The stat. 37 Hen. VIII. c. 9. confined interest to 10 *per cent.* In the reign of Edward VI. religious zeal prohibited all interest. The statute of Henry VIII. was revived by the 13th of Elizabeth, cap. 8. and 10 *per cent.* continued the legal rate of interest till the 21st of James I., when it was restricted to 8 *per cent.* It was reduced to 6 *per cent.* soon after the restoration, and by the 12th of Ann. stat. 2. cap. 16. it was brought down to 5 *per cent.* yearly, which is now the greatest legal interest that can be taken. But yet, if a contract which carries interest be made in a foreign country, our courts will direct the payment of interest according to the law of that country, in which the contract was made.

INTEREST, *Interesse*, in *Law*, is commonly taken for a chattel real, as a lease for years, &c. and more particularly for a future term; in which sense it is said in pleading, that one is possessed *de interesse termini*: therefore an estate in lands is better than a right or interest in them. But in legal understanding, an interest extends to estates, rights, and titles, that a man hath in or out of lands, &c. so as by grant of his whole interest in such lands, a reversion therein, as well as possession, in fee-simple, shall pass.

INTEREST *on legacies*. In case of a vested legacy, due immediately, and charged on land or money in the funds, which yield an immediate profit, interest shall be payable thereon from the testator's death; but if charged only on the personal estate, which cannot be immediately got in, it shall carry interest only from the end of the year, after the death of the testator. If a legacy be devised, and no certain time of payment mentioned, and the legatee be an infant, he shall have interest for the legacy from the expiration of one year after the testator's death; but if the legatee be of full age, he shall have no interest but from the time of the demand of the legacy. Where a legacy is payable at a day certain, it must be paid with interest from that day.

INTEREST, *Punitory*. See PUNITORY.

INTEREST *or no Interest*, a denomination applied to insurances made without having any property on board the

ships, in which large sums were insured. The statute 19 Geo. II. c. 37. enacted that all such insurances should be null and void. See *MARINE INSURANCE*.

INTERESTED WITNESS. See WITNESS.

INTERESTING, in the *Suppl.* to the folio *Encyclopédie*, has been made an article for the *Beaux Arts*, without the least allusion to music. But dull and uninteresting music is, perhaps, more tiresome than the same degree of insipidity in painting and poetry. You can quit a picture or a book whenever you please; but at a public performance of music, you have no escape from the bad composition or performance. A young composer, ambitious of fame, and of endearing himself to the public, should never write for writing sake, he should not seize his pen without ideas, without a subject. There is no art which has more alluring means of obtaining attention. Grace, pathos, fire, fancy, hilarity, rich harmony, and learned modulation, cannot all have admission in the same piece; yet it is absolutely necessary that at least some one of these excellencies should predominate throughout a regular movement. And where a composer, not certain of his fertility and powers of pleasing, has hastily committed his thoughts to paper, he should shut it up in his desk for at least nine days, if not nine years; at the end of which he should perform it as the production of a stranger; then ask himself what *interest* he thinks his piece would excite in an intelligent and impartial audience; and if self-love is not the blindest of all loves, he will perceive where he is dull, and where genius and abilities are wanting.

INTERFEMINEUM, a word used by some to express the perinæum.

INTERFERE, in the *Manege*. A horse interferes, when the sides of one of his shoes strikes against and hurts one of the fetlocks. See CUTTING.

INTERJECTION, in *Grammar*, an expression used to denote some sudden motion or passion of the mind; as *oh! oh!* These exclamations, uttered in a strong and passionate manner, are considered by some writers as the first elements or beginnings of speech.

As the greatest part of the expressions used on these occasions are taken from nature alone, the real interjections in most languages are monosyllables; and as all nations agree in those natural passions, so do they agree in the signs and indications of them; as of love, mirth, &c.

Some deny the interjections to be words, or any part of speech; and make them mere natural signs of the motions or passions of the mind, expressed by these inarticulate sounds, several whereof brutes have in common with us; but as these are passions, and must be represented in discourse, the interjection has a good foundation in nature, and is a necessary part of speech.

Mr. Harris observes, that interjections coincide with no part of speech, but are either uttered alone, or else thrown into a sentence, without altering its form, either in syntax or signification; and that they are not so properly parts of speech, as adventitious sounds; certain voices of nature, rather than voices of art, expressing those passions and natural emotions, which spontaneously arise in the human soul, upon the view or narration of interesting events. *Hermes*, p. 285.

Mr. H. Tooke, in his "*Diversions of Purley*," excludes interjections from the parts of speech; and asserts, that "the dominion of speech is erected upon the downfall of interjections." See GRAMMAR.

The Greeks confound their interjections with adverbs, and the Hebrews confound them with their adverbs and prepositions: calling them all by the general name *particle*.

INTERIM, a term borrowed from the Latin, signifying *in the mean time*. It was first brought into popular use by Charles V. in 1548, in order to compose the disturbances of Germany.

The interim of that prince was a kind of ordinance, or regulation, to be observed in the empire with regard to the articles of religion then controverted, till such time as they should be determined by a council; and therefore was called interim.

When it was laid before the diet, the archbishop of Mentz, president of the electoral college, thanked the emperor for his unwearied endeavours to restore peace to the church, and in the name of the diet, signified their approbation of the system of doctrine which he had prepared, together with their resolution of conforming to it in every particular. Although the whole diet was amazed at a declaration so unprecedented and unconstitutional, as well as at the presumption of the archbishop, in pretending to deliver the sense of the diet, on a point which had not been the subject of consultation or debate; none had the courage to contradict what he had said. The emperor held the archbishop's declaration to be a full constitutional ratification of the interim, and prepared to enforce the observance of it, as a decree of the empire.

It was said to have been drawn up by two Catholics and a Protestant; but as it retained most of the doctrines and ceremonies of the Romanists, though expressed for the most part in the softest words, or in scriptural phrases, or in terms of studied ambiguity, excepting that of marriage, which was allowed to priests, and communion, which was administered to the laity under both kinds, most of the Protestants rejected it. Those who admitted it were nick-named Interimists, or Adiaphorists. Indeed the interim equally disgusted the generality of both parties, the Protestants and Catholics.

Besides this, there were two other interims made: the one called the interim of Leipzig, the other by the divines of Franconia, who, refusing to accept the two former, made another for themselves.

INTERIOR. See **INTERNAL**.

INTERIOR Figure, Angle of. See **ANGLE**.

INTERIOR Polygon. See **POLYGON**.

INTERIOR Talus. See **TALUS**.

INTERLACKEN, in *Geography*, a town of Switzerland, and capital of a considerable bailiwick, in the canton of Berne: deriving its name from an abbey, situated between the lakes of Brienz and Thun, and secularized in the year 1528; 32 miles S.E. of Berne.

INTERLINEATION, something inserted between two lines. See **DEED**.

INTERLOCUTORY DECREE. In a suit in equity, if any matter of fact be strongly controverted, the fact is usually directed to be tried at the bar of the court of king's bench, or at the assizes upon a feigned issue. If a question of mere law arises in the course of a cause, it is the practice of the court of chancery to refer it to the opinion of the judges of the court of king's bench, upon a case stated for that purpose.

In such cases interlocutory decrees or orders are made. See **DECREES**.

INTERLOCUTORY Judgments are such as are given in the middle of a cause, upon some plea, proceeding on default, which is only intermediate, and does not finally determine or complete the suit. But the interlocutory judgments most usually spoken of, are those incomplete judgments, whereby the right of the plaintiff is established, but the *quantum* of damages sustained by him is not ascertained, which is the

province of a jury. In such a case, a writ of inquiry issues to the sheriff, who summons a jury, enquires of the damages, and returns to the court the inquisition so taken, whereupon the plaintiff's attorney taxes costs, and signs final judgment. See **JUDGMENT**.

INTERLOCUTORY Order, that which decides not the cause, but only settles some intervening matter relating to the cause.

As, where an order is made in chancery for the plaintiff to have an injunction to quit possession till the hearing of the cause; this order, not being final, is called interlocutory.

INTERLOPERS are properly those, who, without due authority, hinder the trade of a company, or corporation lawfully established, by dealing in the same way.

INTERLOPING, the intercepting or disturbing the traffic of a company; or the taking up a new trade, or the employment, to the prejudice of those who were brought up in it.

INTERLUCATION, in *Husbandry*, the thinning of a wood, or letting in light between, by lopping or cutting away boughs.

INTERLUDE, an entertainment exhibited on the theatre between the acts of a play, to amuse the spectators while the actors take breath, and shift their dress; or to give time for changing the scenes and decorations.

In the ancient tragedy, the chorus sung the interludes, to shew the intervals between the acts.

Interludes, among us, usually consist of songs, dances, feats of activity, concerts of music, &c.

Aristotle and Horace give it for a rule, that the interludes should consist of songs built on the principal parts of the drama; but since the chorus has been laid down, dancers, buffoons, &c. ordinarily furnish the interludes.

INTERMEDIATE, is usually understood of the space of time elapsed from any certain point to any other.

In *Chemistry*, those substances are called intermediate, by means of which, other substances, incapable of uniting together of themselves, may be united.

INTERMEWING, in *Falconry*, is a hawk's mewing, from the first change of her coat till she turn white.

INTERMEZZO, *Ital.* **INTERMEDE**, *Fr.*, a piece of music, a dance, or a short dramatic scene, generally between two performers of different sexes, exhibited between the acts of a serious opera, to vary the entertainment, and to relieve and enliven the audience, that may be too much oppressed and dispirited by tragic scenes of great interest.

The ancient Romans had satires performed between the acts of their regular comedies; and these were afterwards exhibited as farces at the end of pious pieces.

Tragicomedies had a very early admission on the stage at Bologna during the 17th century: as *Andromeda*, *Tragicomedia*, set by Girolamo Giacobbi, maestro di cappella of San Petronio, and founder of the Academy de' Filomasi, in that city, was performed in 1610; and *Amor vuol Gioventù*, *schirzo drammatico*, at Viterbo, 1659. *Musica di Giambattista Mariani*, 1659. But the only real burlettas which we have met with are *Girello*, *Drama Burlesca*, set by the famous Pistocchi, 1672, which was represented at Venice by little figures of wax: *I dos Diogeno*, *dramma burlesca per musica*, and *Agripina in Baja*, *Schirzo drammatico per musica*, were both performed at Ferrara, 1687.

There are *intermezzi*, says Rousseau, that are true comic or burlesque dramas, which detach the audience from the interest of the principal piece, without taste or reason. As the dance in Italy is never analogous to the drama, they are obliged to admit it on the stage as an *intermezzo*; "but this is

is not what I blame; on the contrary, I think it may be useful to efface, by an agreeable dance, the melancholy impressions left by the events of a grand serious opera; and I see plainly that the subject of this dance should have no connection with the piece; but what offends me, continues the citizen of Geneva, is that they destroy all the interest that has been excited, and render each act a new piece." We suppose he means that the ballet should be given at the end, not in the middle of the opera.

INTERMITTENT, a thing which ceases its action for some time; which time is called the *interval*.

INTERMITTENT, in *Medicine*, any animal motion or action, which ceases and returns at intervals. The period of cessation is termed the *interval*, or *intermission*.

Thus those fevers which, after continuing several hours, altogether go off, and again return at certain intervals, as of one, two, or three days, are called *intermittent* fevers, in contradistinction from those which go through their course with little variation, or with regular diminution and aggravation only; the former being called *continued*, the latter *remittent* fevers. See FEVER and AGUE.

Various other disorders, besides the acute fevers just mentioned, put on the *intermittent* form; such as head-ache, especially the *hemicrania*, or head-ache of one side of the head, the *megrin*, and sometimes the *tic douloureux*; and pains, seated in various other parts of the body, as in the liver, bladder, uterus, &c. It is extraordinary, and does not easily admit of any explanation, that, in parts of the body, suffering severe organic disease, and actually much injured in their structure, the pain connected with this disorder sometimes becomes regularly *intermittent* with intervals of absolute freedom from the distress; while of course no variation can have occurred in the morbid structure. Such intermissions we have witnessed in cancerous and ulcerated conditions of the womb; and, in suppuration in the brain. But, indeed, it is equally difficult to account for the fact in all instances; and no speculations have yet enabled us to explain, why the vessels of any part, (as of the supra-orbital notch, in the case of *megrin*;) or of the whole system, (as in *ague*;) should take on an extraordinary action at regular but distant periods, and continue only their ordinary action in the intervals: whether the parts be actually diseased in structure or not, the periodical recurrence and cessation of increased vascular action is equally inexplicable. Dr. Darwin has ingeniously endeavoured to refer these periodical changes to the influence of our diurnal habits, in regard to activity and sleep, exhaustion of sensorial power and invigoration, and to the diurnal periods of heat and cold, light and darkness, &c. upon all the actions of our frame. That these circumstances greatly influence the operations of the animal body, cannot be doubted: and were all the periods of action and intermission *diurnal* only, we might admit the generalization as correct. But it is not easy to discover how the very frequent *intermissions* of disease, which continue for *tertian* periods, that is, during an interval of forty-eight hours, and still more those which continue for *quartan* periods, of seventy-two hours, can be referred to this general law. See Darwin, *Zoonomia*, vol. i. sect. 36.

The bark of the cinchona, and some other bitter vegetable substances, it is well known, possess a considerable degree of power, when administered during the intermissions, for preventing the recurrence of diseases of this class. But a remedy has been added to the list of the *materia medica*, which seems to have a specific virtue of arresting all *intermittent* affections: we mean the *arsenic*, which had long been used as an empiric nostrum, under the appellation of the "tasteless ague-drop," but which was first prepared in a safe and ma-

nageable form by the late Dr. Fowler, of York, and is now introduced into the pharmacopeia of the College of Physicians of London. This medicine has not only been administered with decided benefit in *intermittent* fevers; but also in the *intermittent* head-ache and *megrin*, with the most marked success. And we have found it, in more instances than one, speedily arrest the *intermittent* pains in diseased uterus, and other organic painful diseases. In a word, arsenic appears to have a specific remedial power over periodical disorders. But in cases of organic disease, its influence is of course confined to the periodic pains connected with them, and is not exerted upon the fixed and continued affection.

The term *intermittent* is also applied to the *pulse*, when, after an indefinite number of beats, it stops during the time of one pulsation, or loses a stroke. This is sometimes a formidable symptom, when connected with other signs of affection of the brain, or of the heart itself; but it is more commonly of minor import, being connected with indigestion, and a general irritability of the system, and is removable by correcting the state of the stomach and other organs concerned in the chylipoetic process. See PULSE.

INTERMITTING SPRINGS, in *Natural History*, or ebbing and flowing wells, are phenomena which attracted a great deal of attention in former times, and several works on natural philosophy contain explanations of the principles on which they might, by a proper application of the syphon, be made, by art, so as afterwards to be self-acting: it can scarcely be doubted but some of the *intermittent* springs were natural, or produced their ebbing and flowing or intermission, without the assistance of art, perhaps that on the N.N.W. side of Tideswell town in Derbyshire, which formerly existed and gave the name to the town, may have been of this number; and perhaps also Laywell springs at Brixham, in Devonshire, may have been natural; but Mr. Farey, in his recent Report on Derbyshire, (vol. i. p. 288.) states the ebbing well at Barmoor, between Cattleton and Chapel-en-le-Frith, on the skirt of Peak forest, in Derbyshire, to occupy the scite of an old stone-quarry, in the first limestone rock, and to be evidently the work of art; he also mentions an artificial well of this kind lately made in the parish of Chapel-en-le-Frith. See SPRING.

INTERNAL ANGLES, are all angles made by the sides of any right-lined figure within.

In a triangle, as KLM (*Plate VIII. Geometry, fig. 103.*) the angles L and M are particularly called *internal* and *opposite*, in respect of the external angle IKM, which is equal to them both. See INTERNAL ANGLES.

INTERNAL Angle, is also applied to the two angles formed between two parallels, by a line intersecting those parallels, on each side the intersecting line.

Such are the angles z and y , and x and v (*Plate VIII. Geometry, fig. 104.*) formed between the parallels OP and QR, on each side of the intersecting line ST.

The two internal angles are always equal to two right angles.

INTERNAL and Opposite Angles, are also applied to the two angles z and x , formed by a line cutting two parallels.

These are respectively equal to A and u, called the external and opposite angles.

INTERNAL Affection, Denomination, Ear, Modes, Orthography, Place, Sense. See the substantives.

INTERNAL Plans, in *Mining*, signify, according to M. Werner (*New Theory of Veins, Transl. p. 194.*), the internal drawings, or sections as they are called in this country, of the mines and the strata, or of rocks in which they occur. Sections of particular districts, formed into tablets, laid

with the principal rocks and minerals of such districts, have long been made by Mr. White Watson of Bakewell, in Derbyshire, Mr. Elias Hall of Castleton, Brown and Co. of Derby, and others, but it has justly been objected to all the tablets or sections of this kind which we have seen, that they represent some imaginary hill or mountain, instead of being in any way proportioned to, or made to represent, the actual strata and outline of any district. Now that mineral surveying, or the methods of obtaining a knowledge of the interior of stratified districts, as well as of ascertaining whether they are so stratified, has been fully explained in the Report to the Board of Agriculture on the County of Derby, by Mr. John Farey, senior, and illustrated by a survey of that interesting and difficult county, we hope that the making of accurate and natural representations or tablets of the interior, or sections of different districts, will be attempted. A very neat and interesting way of disposing a tablet of a gentleman's mineral strata in his estate, is in the front of his chimney-piece, instead of the flat or carved marble slab now generally used. Mr. William Milnes of the Butts in Ashover, in Derbyshire, has employed Mr. W. Watson to make him such a chimney-piece, which forms a very interesting object as well as a subject of contemplation to his friends and visitors.

INTERNODIUM, in *Anatomy*, the space between two articulations. It is only applied to the fingers, where it is employed in naming some of the muscles; at present it is used only in the extensors of the thumb, which are called *extensor primi, and secundi internodii pollicis*.

INTERNODIUM, in *Botany*, the space that is between two knots, or joints, of the stalk of a plant; *e. gr.* of the stalk of straw of wheat, or other corn.

INTERNUS MALLEI, in *Anatomy*, one of the muscles of the ossicula auditus, called more commonly *tensor tympani*. See **EAR**.

INTEROSSEI, a number of small muscles of the hands and feet, so named from being situated in the intervals of the metacarpal and metatarsal bones.

The *interossei* of the hand are seven; *viz.* two for each of the three middle fingers, and one for the little finger. The abductors and the adductor of the thumb supply the places of the *interossei* in that member; and the adductor *ossis metacarpi indicis* holds the place of an internal *interosseus* muscle in the little finger. The *interossei* produce the lateral motions of the fingers to which they correspond; they may therefore be most conveniently arranged as abductors and adductors of their respective fingers. More commonly, however, they are divided into two classes, according as they are placed towards the palm or the back of the hand, and distinguished by the names of *interossei interni priores* or *palmares*, and *externi posteriores* or *dorsales*. In this distribution, the internal class contains four muscles, which are named by Albinus, 1, *indicus prior*, and 2, *posterior*; 3, *prior annularis*; 4, *prior auricularis*; the external has only three; *viz.* 1 and 2, *prior et posterior digiti medii*; 3, *posterior annularis*. Sometimes they are distinguished numerically, beginning from the thumb. The abductor *indicus*, or *semi-interosseus*, (see **ABDUCTOR**), forms the first external *interosseus* of Soemmerring; who therefore enumerates four external *interossei*. This anatomist makes only three internal *interossei*; the 1st, internal *interosseus* of Albinus, being one of the heads of Soemmerring's first external *interosseus*. Both classes are called by some French writers *metacarpo-fus-phalangiens*.

Interossei of the fore-finger. The abductor (*prior indicis* of Albinus, one of the heads of the first external *interosseus* of Soemmerring and others) is attached to the radial flat

surface of the metacarpal bone of the fore-finger; it forms a tendon towards the finger, which is inserted, in common with that of the abductor *indicus*, into the radial side of the metacarpal end of the first phalanx of that finger, having also a slight connection to the extensor tendon; the radial artery dips into the palm of the hand between this muscle and the abductor *indicus*.

The adductor of the fore-finger (*posterior indicis*, Alb.) is placed towards the palm of the hand. It arises from the ulnar flat surface of the 2d metacarpal bone, and from the ligaments which unite that to the trapezoid bone. At the end of the metacarpus it forms a small flat tendon, passes over the articulation of the index and metacarpus, the side and back part of the first phalanx, the articulation between the first and second phalanges, and the dorsal surface of the 2d phalanx. On the middle of the latter bone, it meets at an acute angle with a corresponding tendon of the *lumbricalis*, and the two tendons unite into a broader one, which is slightly contracted and inserted into the middle prominence of the back of the third phalanx. About the middle of the first phalanx, or rather sooner, it becomes united to the broad tendon of the extensor, from which it separates a little before the termination of that tendon.

This connection is formed by a thin and broad tendinous expansion, which closely covers the articulation of the index with the metacarpus.

Interossei of the middle finger. The abductor (*prior digiti medii*) is placed towards the back of the hand: it arises from the ulnar side of the second, and radial side of the third metacarpal bone; and has a middle tendon, in which two oblique rows of fibres terminate. The course of its tendon corresponds exactly to that of the preceding, and is united, at its termination, to that of the succeeding muscle.

The adductor of the middle finger (*posterior medii digiti*) is placed also towards the back of the hand, and has a similar form to the last muscle. It arises from the third and fourth metacarpal bones, and is inserted in the manner already described.

Interossei of the ring-finger. The abductor, (*prior annularis*), placed towards the palm, is attached to the radial side of the fourth metacarpal bone, and to the ligaments which connect it to the carpus. It terminates in a tendon ending as already described. The adductor (*posterior annularis*) is placed towards the back of the hand, arises from the ulnar side of the fourth, and from the radial side of the fifth metacarpal bone, and has a middle tendon placed between two planes of fibres, and inserted like the preceding ones.

The *interossei* of the little finger. This finger has only an abductor (*prior auricularis*), which arises from the radial surface of the fifth metacarpal bone, and from the ligaments joining it to the carpus. Its tendon has a course and insertion like those of the former.

The expansions of the *interossei*, where their tendons begin to join those of the extensors, are connected by many fibres to the capsules of the joints formed between the metacarpal bones and the first phalanges: their aponeuroses are also strengthened by the tendons of the *lumbricales*. The relations of the *interossei* to the surrounding parts may be considered in a general view. On the sides they correspond to the metacarpal bones, and they are reciprocally in contact with each other. They are covered in front by the tendons of the flexor profundus, by the *lumbricales*, and, so far as the three first are concerned, by the abductor *pollicis*. They are retained, towards the end of the metacarpus, by the anterior transverse palmar ligament, at the level of which they

are all directed backwards. On the posterior surface the first interosseus is subcutaneous: the others are covered by thin aponeuroses attached to the corresponding metacarpal bones, separating the interossei from the extensor tendons, and in their intervals from the integuments. Their expanded tendons are placed between the phalanges and the skin.

These muscles seem to perform, as their primary use, the abduction and adduction of the fingers. They serve to fix the extensor tendons; which, not being covered by any fibrous sheaths, required this lateral support. They partake this office with the lumbricales; when the two interossei of any finger act together, the extensor tendon is drawn in the diagonal of their direction. If the fingers are extended, they will be fixed more firmly in this position; but if they are already bent, the flexion is increased by the action of the interossei, which exert themselves so much the more effectually, as their tendon falls perpendicularly in the moving part. From the course which the tendons pursue, along the sides to the backs of the fingers, they will have the effect of extending the middle and last joints. If the fingers are fixed, these muscles may bend the metacarpus to them.

The *interossei* of the foot hold the same relation to the metatarsus, as those of the hand do to the metacarpus; and are arranged into an internal and an external class, or a superior and an inferior; of which the former is placed towards the back, and the latter towards the sole of the foot. They are the adductors and abductors of the toes; and are seven in number, three internal, and four external. Of these, six belong to the three middle toes, and one to the little toe, their place being supplied, in the great toes, by its proper muscles.

The *internal interossei* are the adductors of the third, fourth, and fifth toes. They agree very nearly in their mode of origin, figure, course, termination, and action. They are small and tendinous at their commencement; grow gradually thicker and broader, then again decrease, and form long and flat tendons at the digital end of the metacarpus. They all pass forwards from the metatarsus towards the toes, and end at the tibial sides of the metacarpal extremities of their respective toes, near the terminations of the lumbricales. Their tendons are closely connected to the capsules of the first joints of the toes, to those of the lumbricales, and of the extensors. The first arises from the posterior part of the under surface of the third metatarsal bone on its tibial side: the second from the corresponding part of the fourth, and the third from that of the fifth metatarsal bone. The two latter are also connected to the sheath which contains the tendon of the peroneus longus.

The *external interossei* are 1 and 2, the adductor and abductor of the second toe, 3, the abductor of the third, and 4, the abductor of the fourth. The three latter resemble each other, and resemble also the external interossei of the hand, in having double origins: each of them has two heads, arising from the two contiguous metatarsal bones, tendinous at their commencement, uniting at acute angles in a middle tendon, which passes forwards to the toes. The tendons are thicker and broader than those of the internal interossei, connected in the same way to the capsules of the first joints, and inserted in the same manner, but on the opposite sides of the first phalanges. The abductor of the second toe has its larger origin from rather more than the posterior half of the third metatarsal bone, on its outer or peroneal surface; the smaller head comes from the opposed surface of the second bone. The abductor of the third toe has a larger origin from the fourth, and a smaller from the third bone; and the abductor of the fourth has the same relation in its origin to the fifth and fourth metatarsal bones. The adductor of the

second toe differs from the other external or superior interossei, in arising from one bone only: its origin is derived from more than the posterior half of the inner or tibial surface of the second metatarsal bone: its insertion is similar to that of the others.

The interossei of the foot have the following relations to the surrounding parts: On the back of the foot they are covered by the tendons of the two extensors, and by a very thin aponeurosis, which is sometimes scarcely sensible, and which is extended in the intervals of the metatarsal bones. In the sole they are in contact with the muscles of the great and of the little toe, with the tendons of the flexor longus digitorum and the lumbricales, and with the deep-seated plantar vessels. On their sides they correspond to each other, or to the metatarsal bones.

The motions produced by these muscles are analogous to those of the corresponding ones in the hand. In the first place they are adductors and abductors of their respective toes. They may act as flexors of the first phalanges through the means of their tendons affixed to these bones, more particularly when the first joints are already slightly bent; for they are then directed obliquely or perpendicularly to the moveable point, with which, in the extended state, they are parallel. By the portions, which they detach to the extensor tendons, they may assist the extension of the last phalanges; but it is necessary that the extensors should have previously acted in some degree, to carry the last phalanx upwards and backwards, and this motion is then increased by the interossei. They serve also, as in the hand, to fix the extensor tendons laterally.

INTEROSSEUS, an epithet of certain organs of the body, particularly in the fore-arm and leg, which are situated between two bones. The interosseous artery of the fore-arm is a branch of the ulnar, and is divided into an anterior and a posterior interosseous branch. In the leg, the peroneal artery is sometimes designated by this term. The interosseous ligaments are aponeurotic expansions attached to the opposed edges of the bones of the arm and leg, and filling up the intervals between these bones. See **ARTERY** and **EXTREMITIES**.

INTERPLEADER, *Bill of*, in *Law*, is where a person who owes a debt or rent to one of the parties in a chancery suit, but, till the determination of it, he knows not to which, desires that they may interplead, that he may be safe in the payment. In this last case it is usual to order the money to be paid into court, for the benefit of such of the parties to whom, upon hearing, the court shall decree it to be due. But this depends upon circumstances; and the plaintiff must also annex an affidavit to his bill, swearing that he does not collude with either of the parties.

INTERPOLATION, a term used by critics in speaking of ancient writings and manuscripts, in which some spurious additions or alterations have been since made.

To establish or ascertain an interpolation, P. Ruinart gives us the five following rules. 1. That the piece supposed to be interpolated appear to have all the antiquity it pretends to. 2. That there be good proofs that it has been interpolated. 3. That the supposed interpolations agree to the time of the interpolator. 4. That the interpolations do not touch the foundation of the work; and that they be not too frequent, nor entirely disfigure the piece. 5. That the restitution made, agree perfectly to the rest of the work.

Interpolations have occasioned several of the various readings in the New Testament. Michaelis, in his "Introduction to the New Testament," and also other writers, have suggested how these were introduced, and how they may be distinguished from the original text. *E. G.* If for a passage that

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that is not absolutely necessary to the construction, various readings are found that differ materially from each other, we have reason to suspect its authenticity; and that all the readings are interpolations of transcribers, who have attempted by different methods to supply the seeming deficiency of the original. An interpolation is sometimes betrayed by the circumstance of its being delivered in the language of a later church. To this purpose Michaelis observes, that in the time of the apostles the word "Christ" was never used as the proper name of a person, but as an epithet expressive of the ministry of Jesus, and was frequently applied as synonymous to "Son of God." The expression, therefore, "Christ is the Son of God," (Acts, viii. 37.) is a kind of tautology, and is almost as absurd as to say Christ is the Messiah, that is, the Anointed is the Anointed. But the word being used in later ages as a proper name, this impropriety was not perceived by the person who obtruded the passage on the text. If one or more words, that may be considered as an addition to a passage, are found only in MSS., but in none of the most ancient versions, nor in the quotations of the early fathers, we have reason to suspect an interpolation. Acts, viii. 39. πνευμα [αγιον επεπεσεν επι τον ευαγγελιον, αγγελος δε] Κυρις ηρπισεν τον φιλιππον, is an instance of this kind, where the words between the crotchets are probably spurious. Interpolations of considerable length are occasioned sometimes in the following manner: The owner of a MS. makes a note in the margin, either explanatory of some narrative in the text, or containing an account of some event that was handed down by tradition; which MS., being afterwards transcribed, the copyist writes text and notes without distinction in the body of his work. "I am persuaded," says Michaelis, "that John, v. 4., a very suspicious passage, and omitted in a very great number of MSS. has been intruded in this manner into our present text, and that this scholion was written originally not in Greek, but in some oriental language." The disputed passage in 1 John, v. 7. may probably be a specimen of this kind of interpolation. Its spuriousness has been shown by sir Isaac Newton, in a letter to Le Clerc, first published in London in 1754, and more correctly by Dr. Horsley in 1785, from the author's original copy. (See his edition of Newton's Works, vol. v. p. 495—531.) This letter, says Dr. Marsh, is less known than it deserves, as the immortal author has displayed in it as much critical knowledge, as penetration in his mathematical inquiries. The question has been likewise examined, and with great impartiality, by Bengel, in his "Apparatus Criticus," p. 458—482. 2d ed.; and the dispute has been satisfactorily terminated by the eminently learned Porson, in his "Letters to Travis," published in 1791. See *Various Readings*.

INTERPOLATION, in *Algebra*, is used for the finding an intermediate term of a series, its place in the series being given; and the method of doing this is called the *method of interpolations*.

When the algebraic equation of the series is given, the term required, whether it be a primary or intermediate term, may be found by the resolution of affected equations; but when this equation is not given, as it often happens, the value of the term sought must be exhibited by a converging series, or by the quadrature of curves.

When the first, second, and other successive differences of the terms of a series become at last equal, the interpolation of any term of such a series may be found by sir Isaac Newton's differential method.

The method of interpolation was first invented by Mr. Briggs, Savilian professor of Geometry at Oxford, and applied by him to the calculation of logarithms. His prin-

ciples were followed by Dr. Wallis, who made several ingenious applications of this theory; and by Reginald and Mouton, in France. Sir Isaac Newton, in lemma 5. lib. iii. Phil. Princip. Mathem. gave a most elegant solution of the problem for drawing a curve line through the extremities of any number of given ordinates; and in the subsequent proposition applied the solution of this problem to that of finding from certain observed places of a comet, the place of it at any given intermediate time. Dr. Waring, who adds, that a solution still more elegant, on some accounts, has been since discovered by Messrs. Nicholi and Stirling, has also resolved the same problem, and rendered it more general, without having recourse to finding the successive differences.

The theory of interpolation is of very extensive use, not only in pure analyses and geometry, but in various other subjects of mathematical inquiry and computation, and particularly in astronomy; we shall therefore endeavour to explain the principles upon which it is founded, and shew its application in a few cases to practical operations.

First, then, let a, b, c, d, e, f , &c. represent any series of similar quantities, and let the difference between the first and second, the second and third, the third and fourth, &c. terms, be taken; and these several remainders will form what is called the first order of difference; then again, let the differences of these differences be taken in the same way; and the differences of these last again the same, and so on, which will give the following result, observing, that for the convenience of exhibiting the operation, we have only retained the first remainders in each successive subtraction.

series	a	b	c	d	e	f , &c.
1st diff.		$a - b$				
2d diff.			$a - 2b + c$			
3d diff.				$a - 3b + 3c - d$		
4th diff.					$a - 4b + 6c - 4d + e$	
5th diff.						$a - 5b + 10c - 10d + 5e - f$
6th diff.						$a - 6b + 15c - 20d + 15e - 6f + g$
					&c.	&c. &c.

Now the co-efficients of these terms are respectively the same as those of the co-efficients of the binomial, and the order of their generation evidently follows the same law, and therefore we may conclude with equal certainty, that the n th difference of any series of quantities will be expressed by the formula

$$a - nb + \frac{n(n-1)}{1 \cdot 2} c - \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} d + \frac{n(n-1)(n-2)(n-3)}{1 \cdot 2 \cdot 3 \cdot 4} e - \&c.$$

Now it is obvious, that if the given quantities be such, that any order of their differences become equal to 0, that any one of those quantities may be accurately expressed in functions of the others; thus, for example, suppose the fourth difference to become zero, that is

$$a - 4b + 6c - 4d + e = 0$$

then will
$$e = \frac{-a + 4b + 4d - c}{6}$$

and it is obvious that any other of these quantities might be expressed in a similar manner; and therefore, if all those quantities but one be known, that one may be ascertained. Thus, by way of illustration, suppose we had the three squares $10^2 = 100$, $8^2 = 64$, and $7^2 = 49$, and the square of 9 was required; since the third differences of squares

equal 0, we should have
$$9^2 = \frac{100 + 3 \cdot 64 - 49}{3} = 81$$
, and

the

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the same is obviously true of any terms of which the differences vanish.

But if the differences do not vanish, then any intermediate term found by this method only approximate towards the true result, which is however sufficiently correct in a number of cases; thus, in finding any logarithm, of which those consecutive to it are given, the above formulæ may be successfully employed; for though, in fact, the differences of logarithm never become zero, yet their fourth differences are so small, that by considering them as 0, the error will not effect the truth of the result to 8 or 9 places of decimals.

Exam.—Given the logarithms of 101, 102, 104, 105, to find the logarithm of 103.

Here, calling the log. of 101 = a , of 102 = b , 103 = c , 104 = d , and 105 = e ; and considering the fourth differences of these logs as 0; we shall have from the formula

$$a - 4b + 6c - 4d + e = 0$$

$$c = \frac{4(b + d) - (a + e)}{6}$$

Hence the following computation :

$$\log. 101 = 2.0043214 = a$$

$$\log. 102 = 2.0086002 = b$$

$$\log. 104 = 2.0170333 = d$$

$$\log. 105 = 2.0211893 = e$$

$$4.0256335 = b + d$$

4

$$16.1025340 = 4(b + d)$$

$$\text{subtr. } 4.0255107 = a + e$$

$$6)12.0770233$$

$$\log. 103 = 2.0128372 \text{ as required.}$$

This method of finding the intermediate logarithms between others that are known, though of little importance in the present state of the sciences, was of very essential service to the original computers; and to whom the invention of it is due, or more properly to Briggs alone, who seems to have been the first that entered upon the investigation of this theory.

This doctrine is applied with great success in various astronomical operations, and is the means of saving in many cases immense laborious calculations. Thus, for example, in finding the places of some of the planets, whose motion is not very rapid, it will be sufficiently accurate to find their places by calculation for every fourth or fifth day, and then by means of the method above described, their places for all the intermediate days may be found by interpolating between the known terms, which method will give a result much nearer the truth, than by proportional parts, because this supposes a uniformity both in motion and time, which is not correct.

Again, in computing the moon's place for any particular hour, supposing its place for every day at noon to be given, the method of interpolations may be applied with great success, the results having scarcely any sensible difference from those that arise from actual computation, and we may thus frequently avoid one of the most laborious of astronomical calculations.

By this means also, the place of a comet at any particular time may be ascertained, from observations made on it prior to, and subsequent to, that precise period, as also the times of the equinoxes and solstices, which are determined much

more accurately by this method than can be done by proportional parts, for in this, we are obliged to suppose that the sun's declinations increase and decrease proportionally to the distance of this body from the equinoctial point; which is evidently a false hypothesis. In fact, astronomy has derived more assistance from this theory than any other of the mathematical sciences, although it has been applied to other purposes with very great success; but in order to render its application thus general, a much more accurate and extended investigation of the theory than that which has been at present mentioned becomes necessary, and of which we propose to give a slight view in the subsequent part of this article.

The general problem to be resolved in all these cases is this. Having given two series of numbers, which correspond with one another, according to a certain law, and of which one may be called the series of roots, and the other the series of functions, to find an intermediate number, between two functions, which shall answer or correspond to a given intermediate number between two roots. This problem is treated of in all its generality by Newton, in his "Methodus Differentialis," and by Stirling in his "Tractatus de Summatione, &c.;" see also Lacaille's Astronomy, and a paper by Mayer in the Acta. Petrop. tom. ii. page 108; also an excellent memoir by Lalande, transmitted to the Academy of Sciences of Paris for 1761; in which he has shewn that in calculating the moon's place, and much more that of any other of the heavenly bodies, whose motions are more regular; it will always be sufficient to consider only the third differences, and in many cases only the second differences will be requisite, and sometimes only the first; in fact he has shewn how, and to what degree of accuracy, the method of interpolation may be employed in most cases. The same author has also a very complete article on this subject in the Encyclopédie Méthodique, where, in explaining the nature of astronomical interpolation, he says, suppose a series of numbers 0, 1, 3, 6, 10, 15, 21, &c. of which the differences are unequal, but follow a certain law, being in fact in arithmetical progression as 1, 2, 3, 4, 5, 6, &c. so that the second differences are constant, and equal to unity. Now if we take the alternate terms of this series, as for instance 0, 3, 10, 21, &c. the first differences will be 3, 7, 11, &c. and the differences of these differences will be constant, and equal to 4; that is four times greater than before; because in doubling the interval, we have for the first difference the sum of 1 and 2, and in the other the sum of 3 and 4; hence it follows that the second difference increase in the ratio of the differences between 2 and 3, and 1 and 4: the increase, therefore, being equal to three times the first, this second difference will be equal to four times that; and if we took every third number, the second difference would be 9, and so on.

Thus, in general, the second differences increase as the square of the intervals of the numbers; and hence we have the following rule for supplying the intermediate terms of a series of numbers of which the law of their generation is uniform.

For example, let there be four numbers which may represent longitudes, observed at the interval of 12 hours each; and of which the three differences are 78, 222, and 366, so that their second differences will be constant, and equal to 144; according to the following tablet.

Hours	Nos.	1st Diff.	2d Diff.
0	0		
12	78	78	
24	300	222	144
36	666	366	144

Such.

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Such an example is the most simple that can be conceived in interpolation, but simple as it is, it is all that is required in astronomy, even for the motion of the moon, which is the most irregular of all the planetary bodies; such at least is the assertion of Lalande in the article of the *Encyclopédie* above quoted.

Now knowing the above numbers, or observed longitudes, for every 12 hours, it will be easy, by means of the above rule, to find the same for every six hours; for since, in this case, the second differences ought to be only one-fourth of those above, that is 36, it will therefore only be necessary to construct a series of numbers beginning at 0, whose second differences are 36, and whose second term shall be 78; therefore $\frac{78 - 36}{2} = 21$ is the first term of the first differences;

and all the other terms will be found by adding successively to this, the constant second difference 36; thus

1st diff.	21,	57,	93,	129,	165,	201
Nos. or long.	0.21,	78,	171,	300,	465,	666.

But if, instead of interpolating one term between each of the given numbers, it had been required to interpolate two terms, then we must have taken a ninth part of the above second difference, *viz.* 16, and found from hence a series of numbers whose second difference should be 16, and the third term of the series = 78. Now in order to find this series, it will be sufficient to find the first term of the 1st differences, as all the rest that is required may be determined from this; suppose, then, this term to be x , which is also the first term of the required series, then the second will be $2x + 16$, and the third $3x + 48$; whence $3x + 48 = 78$, or $x = 10$; which gives for

the 1st diff.	10,	26,	42,	58,	74,	90,	106,	&c.
Nos. or long.	0.10,	36,	78,	136,	210,	300,	406,	&c.

and on similar principles may the interpolation in any other case be effected with the same degree of ease and accuracy; that is, generally, in order to interpolate any number of terms n , between any two given terms of a known series, we must divide the second difference of the given series by $(n + 1)^2$, in order to have the second difference of the new series; and then again in order to obtain the 1st differences, we have this formulæ; where $d = 1$ st term 1st diff. of the given series; and $d'' = 2$ d difference new series,

$$1\text{st term } 1\text{st diff.} = \frac{d'}{n + 1} \pm \frac{n d''}{2};$$

which may be more conveniently expressed in terms of the 1st and 2d differences of the given series as follows; $d = 1$ st difference, $d' = 2$ d difference of the given series, then the 1st term 1st diff. of the new series, becomes

$$= \frac{2 d' (n + 1) \pm n d''}{2 (n + 1)^2},$$

and this term being thus determined, all the others are readily obtained; and consequently also all the intermediate terms which were to be interpolated. The consideration of second differences, which render the interpolation so extremely easy, is, as we before observed, sufficiently exact for the greater part of astronomical calculations, particularly in the construction of tables; it was thus that Sharp in 1695 calculated his table of right ascension and declination for every degree of latitude and longitude; having first calculated *trigonometrically* the same for every fifth degree, the other intermediate degrees having been ascertained by means of the theory of interpolation. Mouton also, on similar principles, calculated the declination of the sun for every minute of

longitude in seconds and thirds, having first found *trigonometrically* the same for every degree. In general, whatever be the nature of the calculation, it will be sufficient to ascertain rigorously by trigonometry, or otherwise, terms at such a distance that their third differences may become zero, or so small that no sensible error will arise in considering them as such, and then all the intermediate terms may be supplied by the theory which has been investigated. Lalande has published in the "*Connaissance des Temps* for 1771," a very commodious table for abridging these kind of operations, and there is another still more extended in the "*Recueil des Tables de Berlin*."

The same theory of second differences may also be conveniently applied to correct calculations and observations, that is, by ascertaining the uniformity of the remainders or differences.

For example, a series of observations being submitted to this test, ought to have a certain order of their differences uniform, and if in any place such a uniformity is not observed, one difference being greater, or less, than another, it may be concluded with certainty, that some error has been committed in the corresponding observation; the correction of which may be readily made, without repeating the observation; Lalande has also given, in his memoirs above-mentioned, general formulæ of correction, for all such cases, and which may be applied with the greatest facility, and the correction computed to the utmost possible accuracy.

On nearly the same principles as the foregoing, the extraction of roots, as the square root, cube root, &c. may be effected with great ease, by knowing certain equidistant roots. The application in this case being extremely simple, it may not be amiss to enter a little into the explanation of it.

Let then

$$(x^3 + 1)^{\frac{1}{3}} = x + \frac{1}{3x^2} - \frac{1}{9x^5} + \frac{5}{81x^8} - \frac{10}{243x^{11}} + \&c.$$

$$(x^3)^{\frac{1}{3}} = x$$

$$(x^3 - 1)^{\frac{1}{3}} = x - \frac{1}{3x^2} - \frac{1}{9x^5} - \frac{5}{81x^8} - \frac{10}{243x^{11}} - \&c.$$

represent the cube roots of any three consecutive numbers, the differences of which are

$$1\text{st diff.} \begin{cases} \frac{1}{3x^2} + \frac{1}{9x^5} + \frac{5}{81x^8} + \frac{10}{243x^{11}} + \&c. \\ \frac{1}{3x^2} - \frac{1}{9x^5} + \frac{5}{81x^8} - \frac{10}{243x^{11}} + \&c. \end{cases}$$

$$2\text{d diff.} \quad \frac{2}{9x^3} + \frac{20}{243x^{11}} + \&c.$$

In the same way, was it necessary, we might have found the third and fourth differences, and so on; but in the case we shall suppose, of $x^3 > 1000$, or $x > 10$, this second difference is sufficiently exact, and even the second term of this second difference is so small, that it may be omitted without affecting even the eleventh place of decimals, for

taking $x = 10$, we have $\frac{20}{243 x^{11}} = \frac{2}{243000000000}$, which,

when converted into a decimal, will not give an effective figure before the 11th place; we may, therefore, without any sensible error, call $\frac{2}{9x^3}$ the second difference, which will remain

constant for several terms, while our extraction is not carried farther

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Farther than to eight decimal places. Supposing, therefore, the cube root of any two consecutive numbers greater than 1000 to be known, that is, $\sqrt[3]{x^2-1}$, and $\sqrt[3]{x^2}=x$; the first difference is ascertained by simple subtraction, and the second difference is found by the formula $\frac{2}{9x^3}$; and with these data, we may calculate eight or ten of the subsequent roots, when a new computation becomes necessary.

This is not, however, the simplest manner of employing the formulæ that have been deduced, because it requires the knowledge of two consecutive roots, whereas it will be sufficient to have the roots of numbers equidistant from each other, and by means of which the first and second differences may be readily obtained, and the successive extractions will thus become so many different checks upon each other. Suppose, for example, that we know the cube roots of 2000 and 2008; that is, $\sqrt[3]{2000}=a$, and $\sqrt[3]{2008}=b$; and it were required to find the roots of all the intermediate numbers; calling the first difference $=d$, and the second

difference $=\frac{2}{9a^3}=c$; then the cube roots will stand thus:

$$\begin{aligned}\sqrt[3]{2000} &= a \\ \sqrt[3]{2001} &= a + d \\ \sqrt[3]{2002} &= a + 2d - c \\ \sqrt[3]{2003} &= a + 3d - 3c \\ \sqrt[3]{2004} &= a + 4d - 6c \\ \sqrt[3]{2005} &= a + 5d - 10c \\ \sqrt[3]{2006} &= a + 6d - 15c \\ \sqrt[3]{2007} &= a + 7d - 21c \\ \sqrt[3]{2008} &= a + 8d - 28c = b.\end{aligned}$$

And since this last root ought to be equal to the known root b , we have a secure check upon all the preceding part of the operation; or more properly, this condition may be employed for finding the first difference d , and the check be made upon the subsequent difference; for since $a + 8d - 28c = b$, we have $d = \frac{b + 28c - a}{8}$. This operation

will be better understood from the following work at length.

Given the cube root of 6280 = 18.449582727, and of 6288 = 18.45741356, to find all the intermediate roots between those numbers.

By logarithms we find $\frac{2}{9\sqrt[3]{6280}} = .00000105 = c$,

and hence $\frac{b - a + 28c}{8} = .00979222 = d$; hence, again, the following operation.

$$\begin{aligned}\text{Cube root } 6280 &= 18.449582727 \\ &\quad 979222 \text{ difference} \\ 6281 &= 18.450561949 \\ &\quad 979117 \text{ difference} \\ 6282 &= 18.451541066 \\ &\quad 979012 \text{ difference} \\ 6283 &= 18.452520078 \\ &\quad 978907 \text{ difference}\end{aligned}$$

$$\begin{aligned}\text{Cube root } 6284 &= 18.453498985 \\ &\quad 978802 \text{ difference} \\ 6285 &= 18.454477787 \\ &\quad 978697 \text{ difference} \\ 6286 &= 18.455456484 \\ &\quad 978592 \text{ difference} \\ 6287 &= 18.456435076 \\ &\quad 978487 \text{ difference} \\ 6288 &= 18.457413563\end{aligned}$$

And thus may the extraction be carried on at pleasure, by simple addition and subtraction; the cube roots of certain periodical terms being first known: it is unnecessary to observe that the above successive differences are found by subtracting always .00000105 from the foregoing one.

At present we have only considered the mere elementary principles on which the theory of interpolation is founded; it will be proper, however, before we conclude this article, to give some idea of the general formulæ and results obtained from these simple and obvious truths, by Newton in his "Methodus Differentialis;" and by Stirling, in his tract entitled "Tractatus de Summatione et Interpolatione Serierum Infinitarum," published in 1730, both of which works are worthy of their celebrated authors.

Let us imagine a right line given in position, on which let there be erected any number of ordinates parallel to one another, and at equidistances, which ordinates may be conceived to represent the terms of a regular series, continually increasing or decreasing; and one and the same curve will pass through all their extremities, the equation of which will be determined from the given equation to the series; that is, from the equation expressing generally the relation between any two or more successive ordinates: and if this equation be finite, the equation of the curve will also be finite, and consequently an absolute interpolation of the series may be effected; for this is nothing more than assigning to every particular absciss, its corresponding ordinate, and this will always be the case if any order of the differences become equal to zero; thus, in all kinds of figurate numbers, as *triangulars, squares, pentagonals*, &c. the curve passing through their summits will be the common conical parabola. But if, as is frequently the case, no order of differences become zero, then the algebraic equation of the curve cannot be found, and consequently no interpolation can then be made, except by means of an infinite series, the quadrature of some curve, or some other approximation.

Let there be proposed, for example, the series 1, 8, 27, 64, &c. the general interpolation of which is required. This series is no other than that of the natural cubes, and therefore the method that we are about to follow is wholly unnecessary in this case, but the example is chosen in order to illustrate the general method, which is applicable in all cases, even when the terms of the series appear to follow no certain law. We first write the terms of the proposed series in one line, then the differences of these in the next, and then again the differences of these, and so on, till the last order of differences become all equal, or such that no sensible error will arise in considering them as such; then considering x as any absciss, the first terms of these successive differences will be the co-efficients of the series of terms

$$1, x, \frac{x(x-1)}{1.2}, \frac{x(x-1)(x-2)}{1.2.3}, \&c.$$

O o

which

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which expression will then represent the corresponding ordinate to the absciss z ; and consequently the interpolation of the series may be made general. Thus in the example proposed,

Series	1	8	27	64
1st diff.		7	19	37
2d diff.			12	18
3d diff. const.				6

Therefore, considering y as the corresponding ordinate to the absciss z , we have

$$y = 1 + 7z + \frac{12 \cdot z(z-1)}{1 \cdot 2} + \frac{6 \cdot z(z-1)(z-2)}{1 \cdot 2 \cdot 3}, \text{ or}$$

$$y = 1 + 3z + 3z^2 + z^3,$$

as it ought to be, from the nature of the series. If, therefore, now we had to interpolate a term between each of the given ones, these terms would be $(1\frac{1}{2})^3$, $(2\frac{1}{2})^3$, $(3\frac{1}{2})^3$, $(4\frac{1}{2})^3$, &c.

And the same method is applicable in all cases, but it sometimes admits of abbreviation, if the law of the series can be determined, and therefore this should be the first consideration when the law is not evident.

Let there now be proposed the series

$$1, \frac{1}{2}, \frac{3}{8}, \frac{5}{16}, \frac{35}{256}, \&c.$$

where the law is not obvious, the interpolation of which is required.

Series	1	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{35}{256}$	$\frac{63}{256}$ &c.
1st difference		$-\frac{1}{2}$	$-\frac{1}{8}$	$-\frac{1}{16}$	$-\frac{5}{128}$	$-\frac{7}{256}$ &c.
2d difference			$\frac{3}{8}$	$\frac{1}{16}$	$\frac{3}{128}$	$\frac{3}{256}$ &c.
3d difference				$-\frac{5}{16}$	$-\frac{3}{128}$	$-\frac{7}{256}$ &c.
4th difference					$\frac{35}{128}$	$\frac{7}{256}$ &c.
5th difference						$-\frac{63}{256}$ &c.

Hence assuming y for any ordinate corresponding to any proposed absciss z , the equation of the curve passing through the summits of the ordinates, will be

$$y = 1 - \frac{1}{2}z + \frac{3}{8} \cdot \frac{z(z-1)}{1 \cdot 2} - \frac{5}{16} \cdot \frac{z(z-1)(z-2)}{1 \cdot 2 \cdot 3} + \frac{35}{128} \cdot \frac{z(z-1)(z-2)(z-3)}{1 \cdot 2 \cdot 3 \cdot 4} - \frac{63}{256} \cdot \frac{z \cdot (z-1)(z-2)(z-3)(z-4)}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5}.$$

But as the object of our inquiry is more particularly directed to the finding of the first interpolated term, represented above by x , we must make $z = \frac{1}{2}$; whence the above is reduced to

$$x = -\frac{1}{4}A + \frac{3}{16}B + \frac{15}{36}C + \frac{35}{64}D \&c.$$

in which series the order of formation of the co-efficients is obvious, A, B, C, D, &c. being representatives of the preceding terms; and hence, by the summation of the series, the value of x is found equal to 0.64052, and consequently

By a little attention it will be seen that the series is produced from the successive multiplication of the terms of the series $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}$; in which the order of formation is manifest, and the interpolation of this, except for the term between 1 and $\frac{1}{2}$, is evident; the other interpolated terms being $\frac{2}{3}, \frac{4}{5}, \frac{6}{7}$, &c.: let then the term between 1 and $\frac{1}{2}$ be x , then the series after interpolation will be

$$1, x, \frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \&c.$$

and as the proposed series is generated from the continued multiplication of the series $1, \frac{1}{2}, \frac{3}{4}, \frac{5}{6}$, &c.; so will the interpolated terms required, be generated from the continued multiplication of the interpolated terms of this last series, which will therefore be

$$x, \frac{2}{3}x, \frac{2 \cdot 4}{3 \cdot 5}x, \frac{2 \cdot 4 \cdot 6}{3 \cdot 5 \cdot 7}x, \&c.$$

All, therefore, that is required, is to find the value of x , from which any interpolated term may be determined; and it may be further observed, that the term x of the above generating series must necessarily be the second term of the required series after interpolation, or that term which falls between 1 and $\frac{1}{2}$. Let therefore the differences be taken as follows, viz.

from what has been before observed, the interpolation of the proposed series is now complete, being as follows:

$$1, x, \frac{1}{2}, \frac{2}{3}x, \frac{1 \cdot 3}{2 \cdot 4}, \frac{2 \cdot 4}{3 \cdot 5}x, \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6}, \frac{2 \cdot 4 \cdot 6}{3 \cdot 5 \cdot 7}x, \&c.$$

If it had been required to interpolate two terms between each of the given terms, it would have only been necessary to have assumed $z = \frac{1}{3}$, and $\frac{2}{3}$, as is evident; and therefore needs no illustration.

Hence we see that the general equation of any curve, made to pass through the summits of any number of equidistant ordinates, a, b, c, d, e, f , &c. will be

$$y = a + (b-a)z + (c-2b+a) \frac{z(z-1)}{1 \cdot 2} + (d-3c+3b-a) \frac{z \cdot (z-1)(z-2)}{1 \cdot 2 \cdot 3} \&c.$$

which is Newton's formula in his "Methodus Differentialis." The limits of our article will not admit of a farther development of the theory of interpolations, we must therefore refer the reader, who wishes for more complete information,

formation, to the work of Newton above quoted; to Stirling's "*Tractatus de Summatione*," &c. or to the translation of the same by Holliday, published in 1749; and to the other tracts mentioned in the preceding part of this article, by Lalande, Mayer, &c. See also *SERIES*.

INTERPOSED ATTIC. See *ATTIC*.

INTERPOSITION, the situation of a body between two others, so as to hide them, or prevent their action.

The eclipse of the sun is occasioned by an interposition of the moon between the sun and us; and that of the moon by the interposition of the earth between the sun and moon.

INTERPRETATION of *Laws* depends on more equitable and excellent principles than those which prevailed among the Romans, who, when any doubt arose upon the construction of their laws, stated the case to the emperor in writing, and took his opinion upon it. To interrogate the legislature, says judge Blackstone, to decide particular disputes, is not only endless, but affords great room for partiality and oppression. The fairest and most rational method to interpret the will of the legislator is by exploring his intentions at the time when the law was made, by signs the most natural and probable. These signs are either the words, the context, the subject-matter, the effects and consequence, or the spirit and reason of the law. *Words* are generally to be understood in their usual and most known signification. If words are dubious, their meaning may be established from the *context*. Thus the preamble often serves to aid the construction of an act of parliament; and the comparison of one law with other laws, made by the same legislator, and bearing some affinity or relation to the subject, will answer a similar purpose. As to the *subject-matter*, words are always to be understood as having a regard to it. With respect to the *effects and consequence*, the rule is, that where words bear either none, or a very absurd signification, if literally understood, we must a little deviate from the received sense of them. But after all, the most universal and effectual way of discovering the true meaning of a law, when the words are dubious, is by considering the *reason and spirit* of it; or the cause which moved the legislator to enact it. For when this reason ceases, the law itself ought likewise to cease with it. From this method of interpreting laws by the reason of them, arises what we call *equity*; which see.

INTERPRETER, a person who explains the thoughts, words, or writings, of some other, which before were unintelligible.

The word *interpretes*, according to Isidore, is composed of the preposition *inter*, and *partes*, as signifying a person in the middle betwixt two parties, to make them mutually understand each other's thoughts. Others derive it from *inter*, and *pras*, *i. e.* *fidejussor*, *q. d.* a person who serves as security between two others, who do not understand one another.

There have been great debates about interpreting scripture. The Romanists contend, that it belongs absolutely to the church; adding, that where she is silent, reason may be consulted; but, where she speaks, reason is to be disregarded. The Protestants generally allow reason to be the sovereign judge, or interpreter, though some among them have a strong regard to synods, and others to the authority of the primitive fathers. Lastly, others have recourse to the spirit within every person to interpret for them; which is what Bochart calls *πνευματικὴ τῆς προφητείας*. It is, or at least ought to be, the fundamental principle of all Protestants, and indeed of all Christians, that every man should interpret scripture for himself, admitting no compulsory or

controlling authority, but at the same time availing himself of all the assistances which others may afford for directing his inquiries and determining his judgment. "Let every man," says scripture itself, "be fully persuaded in his own mind."

INTERREGNUM, the time during which a throne is vacant, or a kingdom without a head.

In hereditary kingdoms, as England, there are properly no interregnums. (See *Right of CROWN*.) In elective kingdoms, the interregnums are extremely liable to factions and disorders.

INTERREX, a magistrate who governs during an interregnum, or in the interval between the death of a monarch and the election or inauguration of his successor.

This magistrate was established in old Rome, and was almost as ancient as the city itself. After the death of Romulus there was an interregnum of a year, during which the senators were each interrex in their turn, five days a-piece.

After the establishment of consuls, and a commonwealth, though there were no kings, yet the name and function of interrex were still preserved; for when the magistrates were absent, or when there was any irregularity in their election, or they had abdicated, so that the comitia could not be held, provided they were unwilling to create a dictator, they made an interrex, whose office and authority were to last five days; after which they made another. To the interrex was delegated all the regal and consular authority, and he performed all their functions. He assembled the senate, held comitia, or courts, and took care the election of magistrates was according to the rules. Indeed, at first it was not the custom of the interrex to hold comitia; at least we have no instance of it in the ancient Roman history.

The patricians alone had the right of electing an interrex. This office fell with the republic, when the emperors made themselves masters of every thing.

INTERMENT, INTERMENT, or *Entertainment*, the act of *interring*, *i. e.* burying, or laying a deceased person in the ground. See *BURIAL*.

The excommunicated are not to be interred in holy, *i. e.* in consecrated ground. The ancients did not inter their dead; they burnt them, as the Indians do at this day. See *BURNING*.

The Abyssinians, in lieu of interring their dead, shut them up in the bodies of trees, dug hollow for this purpose.

Gardeners also inter, or earth up, celery, endive, and lettuce, to blanch, or whiten, and make them the tenderer.

To inter wild flocks in ditches, is what Columella calls *deponere semina ferobibus*. There are some seeds, as willows, olives, &c. which grow very well, by *interring* their truncheons, *i. e.* cutting a truncheon, or piece, off at both ends, and planting it in the ground; which is what the Latins call *inhumare taleas, taleis ferere*.

INTERROGATE, a judiciary act, performed by a judge, or commissioner deputed to examine or question a party; who first gives his oath, that he will answer truly to every thing he is interrogated.

INTERROGATION, in *Rhetoric*. See *ENOTESIS*.

As to the difference between *interrogation* and *exclamation*, (which see) we may observe, that interrogations are often employed with propriety in the course of no higher emotions than naturally arise in pursuing some close and earnest reasoning; whereas exclamations belong only to stronger emotions of the mind, as surprise, admiration, anger, joy, grief, and the like. Both interrogation and exclamation, and all passionate figures of speech, being natural signs of a moved

and agitated mind, when properly used, operate upon us by means of sympathy. Hence it follows, that the great rule with regard to such figures is, that the writer attend to the manner in which nature dictates to us to express any emotion or passion, and that he give his language that turn and no other; above all, that he never affect the style of a passion which he does not feel. Interrogations may be used with freedom; but nothing has a worse effect than the frequent and unseasonable use of exclamations to which raw and juvenile writers are addicted. They render compositions frigid to excess.

INTERROGATION, in *Grammar*, is a point which serves to distinguish such parts of a discourse, where the author speaks as if he were asking questions. Its form is this (?).

INTERROGATORIES, in *Law*, are particular questions demanded of witnesses brought in to be examined in a cause, especially in the court of chancery. And these interrogatories must be exhibited by the parties in suit on each side; which are either direct for the party that produces them, or counter on behalf of the adverse party; and generally both plaintiff and defendant may exhibit, direct, and counter or cross interrogatories. They are to be pertinent, and only to the points necessary; and either drawn or perused by counsel, and to be signed by them. See **COMMISSION to examine witnesses**, and **EXAMINATION of witnesses**. See also **CONTEMPT**.

INTERRUPTED SUTURE, in *Surgery*. See **SUTURE**.

INTERRUPTION, in *Matters of Proportion*, denotes the same with *disjunction*.

It is noted thus (::), and signifies the breaking off of the ratio in the middle of four disjunct or discrete proportionals: as $A : B :: C : D$; that is, as A is to B so is C to D . See **RATIO, PROPORTION, &c.**

INTERRUPTION is also a figure in *Rhetoric*, wherein a person breaks off his discourse suddenly, to shew some passion.

INTERSCENDENT, in *Algebra*, is applied to quantities, when the exponents of their powers are radical quantities. Thus $Z^{\sqrt{2}}$, $z^{\sqrt{m}}$, &c. are interscendent quantities. See **FUNCTION**.

INTERSECTION, in *Mathematics*, the cutting of one line or plane by another; or the point or line wherein two lines, or two planes, cut each other.

The mutual intersection of two planes is a right line. The centre of a circle is in the intersection of two diameters. The central point of a regular or irregular figure of four sides, is the point of intersection of the two diagonals.

The equinoxes happen when the sun is in the intersections of the equator and the ecliptic.

INTERSOILING, in *Husbandry*, the laying one kind of soil, or mould, upon another; as clay on sand, sand on earth, &c.

INTERSPERSUM VACUUM. See **VACUUM**.

INTERSPINALES, in *Anatomy*, are small muscles placed in the intervals of the spinous processes of the vertebrae, and distinguished as belonging to the neck, back, or loins.

Interspinales colli, interspiniens, epineux du cou, are arranged in pairs, as the processes, to which they are connected, are bifurcated. There are six pairs, of which the first is placed between the spinous processes of the second and third cervical vertebrae, the second between the third and fourth, and so on to the sixth, which is found between the last cervical and first dorsal vertebrae. Their surfaces are flattened, and they have some resemblance to lengthened squares; on the outside, they are in contact with the multi-

fidus spinæ; on the inside, the two muscles composing the pair are in contact; their upper and lower edges are fixed to the spinous processes which bound the intervals containing them. With the exception of a few short aponeurotic fibres at their extremities, they are entirely fleshy. By approximating the spinous processes, they extend the cervical portion of the spine.

Interspinales dorsi, epineux du dos. Small muscles are sometimes placed between the spinous processes of the lower lumbar vertebrae; but they are more frequently absent.

Interspinales lumborum, epineux des lombes. These are six in number, seldom deficient, tendinous at their extremities, and attached above and below to the spinous processes of the lumbar vertebrae. They are covered at the sides by the multifidi spinæ. The first is placed between the twelfth dorsal and first lumbar vertebra; the sixth between the last lumbar and the sacrum. They produce in the loins the same effect as the corresponding muscles do in the neck.

INTERSTELLAR, a word used by some authors to express those parts of the universe that are without, and beyond, the limits of our solar system.

In the interstellar regions are supposed to be several other systems of planets moving round the fixed stars, as the centres of their respective motions; and if it be true, as it is not improbable, that each fixed star is thus a sun to some habitable orbs, that move round it, the interstellar world will be infinitely the greatest part of the universe.

INTERTIES, or **INTERDUCES**, in *Architecture*, those small pieces of timber which lie horizontally betwixt the summers, or betwixt them and the fell, or raising plate.

INTERTRANSVERSI, in *Anatomy*, or *intertransversarii*, or *intertransversales*, are small muscles belonging to the spine, placed in the intervals of the transverse processes of the vertebrae, and distinguished in the different regions of the spine by the additional terms of *colli*, *dorsi*, and *lumborum*.

Intertransversi colli, intertransversiens, petits transversaires du col. These muscles are distinguished into anterior and posterior, as the transverse processes to which they are attached, are bifid at their ends. The anterior ones are six in number; the first is placed between the transverse processes of the first and second vertebrae, and the sixth between those of the sixth and seventh. They are flattened in their figure, and the first is longer than the succeeding ones. On the front, they are covered by the rectus capitis major anticus; behind, they are in contact with the anterior branches of the cervical nerves; their upper and lower margins are attached to the transverse processes.

The posterior intertransversi are five in number, the first being placed between the transverse processes of the second and third vertebrae, and the fifth between those of the sixth and seventh. They very much resemble the preceding muscles. They correspond in front to the anterior branches of the cervical nerves, and are covered behind by the splenius, transversalis colli, and sacrolumbals. Their margins are fixed to the transverse processes. They are almost entirely fleshy. By drawing the transverse processes together, these muscles will inflect the neck laterally.

Intertransversi dorsi, petits transversaires du dos. These resemble in the back the corresponding muscles of the loins, but are smaller; they are placed between the points of the transverse processes. Some of the lower ones are of a conspicuous size; they become gradually more slender and tendinous, and, in the upper part of the back, appear more like thin tendons than muscles. In the latter situation they often do not exist. In front they lie on the intercostal muscles,

muscles, and they are covered behind by the longissimus dorsi and sacrolumbalis; above and below they are fixed to the transverse processes. They produce the lateral inflexions of the dorsal vertebrae.

Intertransversi lumborum, transversaires des lombes. These are small muscular planes filling the intervals between the transverse processes of the lumbar vertebrae. Their number is five, the first being placed between the last dorsal and the first lumbar vertebra, and the last between the fourth and fifth lumbar vertebrae. They are thin, flattened, and quadrilateral. They correspond in front to the quadratus lumborum, and behind, to the sacrolumbalis; their upper and lower edges are fixed to the transverse processes. They are almost entirely fleshy. Their office is that of inclining the vertebral column towards one side, or of restoring it to the erect state after it has been so inclined.

INTERTRIGO, in *Medicine*, *παρτερημα* of the Greeks, signifies an erythematous affection of the skin, a smooth, shining redness and tenderness of the part, chiefly from friction.

The *intertrigo* most commonly arises in those parts of the surface, which lie in contact with each other, and are liable therefore to considerable attrition during motion; or in those which are subject to friction and pressure from other causes; and more especially when, at the same time, any acrid fluid is present. Whence it is very frequent about the top of the thighs and the perineum of infants, when the cloths in which they are wrapped become wetted with the urine. Similar affections of the skin are also liable to occur in persons who take exercise on horseback, or in the feet of those who have walked a considerable distance, especially in tight shoes, and in the backs and shoulders of sick persons, long confined to bed. The first of these varieties, which occur in the *plicæ* or duplicatures of the skin, or originate from the attrition of the bandages impregnated with urine, &c. Sauvages has called *Erythema intertrigo*; the latter from friction of the clothes, or bed, he denominates *Erythema paraterima*. See his Nosol. Method. Class. i. Genus. II. spec. 5 and 6.

Dr. Willan also treats of the former varieties of the disorder under the same head. When speaking of erythema, he says, we may rank under the present article that species of intertrigo which is produced in some persons by the attrition of contiguous surfaces, as beneath the breasts, round the *axilla*, in the groin, and at the upper part of the thighs, and is attended with a glairy and fetid secretion. The intertrigo is most troublesome when it affects the thighs; it commences where they are in contact with the scrotum, and extends upwards to the groin and *nates*, round the *scrotum*, and down the hollow of the thigh. In places where the friction is strongest, the redness is continuous, but it terminates at the edges in a mixed colour, such as characterizes efflorescences generally. This complaint is most frequent in very warm weather, and affects persons of the sanguine temperament, especially those who are corpulent. It sometimes terminates in the *prurigo*, or *psoriasis scrotalis*. An appearance analogous to the intertrigo, is produced by acrimonious discharges in persons labouring under dysentery, gonorrhœa, &c.; in females affected with fluor albus, or uterine scirrhus, and in infants, from the stimulus of the urine, &c. with which their clothes are almost constantly wetted. (See Willan on Cutaneous Diseases, p. 481.) He refuses to class this morbid state of the skin with excoriation, or superficial ulceration, as several writers both ancient and modern have done; and therefore excludes from the intertrigo those excoriations included in the 6th species, or *Erythema paraterima*, of Sauvages.

Frequent ablution with tepid water is necessary to allay

the heat and uneasiness which attend this complaint, to remove the viscid secretion from the surface, and to prevent excoriation. When the skin is fretted by the discharge of an acrimonious fluid, some relief is obtained by the application of dry absorbent powders; in case of abrasion and fissures, the elder-ointment may be applied with much advantage.

INTERTWISTED SUTURE. See **SUTURE**.

INTERVAL, the distance or space between two extremes, either in time or place.

The word comes from the Latin *intervallum*, which, according to Isidore, signifies the space *inter fossam et murum*, between the ditch and the wall: others note, that the stakes or piles, driven into the ground in the ancient Roman bulwarks, were called *valla*, and the interstices or vacancy between them *ervalla*.

INTERVAL, *Angle of.* See **ANGLE**.

INTERVALS, *Lucid.* See **LUCID**.

INTERVAL, in *Musical*, the difference between two sounds, in respect of acute and grave; or that imaginary space terminated with two sounds differing in acuteness or gravity. When two or more sounds are compared in this relation, they are either equal or unequal in the degree of tune: such as are equal are called *unisons*, with regard to each other, as having one tune; the other, being at a distance from each other, constitute what we call an *interval* in music; which is properly the distance in tune between two sounds.

Intervals are distinguished into *simple* and *compound*.

INTERVAL, *Simple*, is that without parts, or division: such are the octave, and all that are within it; as the second, third, fourth, fifth, sixth, and seventh, with their varieties.

INTERVAL, *Compound*, consists of several lesser intervals: such are all those greater than the octave; as the ninth, tenth, eleventh, twelfth, &c. with their varieties. But this distinction, it is to be observed, regards practice only, because there is really no such thing as a least interval. Besides, by a *simple* interval is not meant here the least practised, but such as though it were equal to two or more lesser, which are in use, yet when we would make a sound move so far up or down we always pass immediately from one of its terms to the other. What is meant then by a *compound* interval will be very plain: it is such, whose terms are in practice taken either in immediate succession, or such where the sound is made to rise and fall from the one to the other, by touching some intermediate degree; so that the whole becomes a composition of all the intervals from one extreme to the other.

What we here call a *simple* interval, the ancients called a *diastema*, and the *compound* they call a *synstema*.

Each of these had its differences; even of the *simple* there are some greater, and others less: but they are always discord; but of the *compound*, or *systems*, some are concord, others discord. Unisons, it is plain, cannot possibly have any variety; for where there is no difference, as in unisonance, which flows from a relation of equality, it is plain there can be no distinction: unisons therefore must all be concords. But an interval depending on a difference of tune, or a relation of inequality, admits of variety: and so the terms of every interval, according to their particular relation or difference, make either concord or discord. Some indeed have restrained the word *concord* to intervals, making it include a difference in tune: but this is precarious; for as the word *concord* signifies an agreement of sounds, it is certainly applicable to unisons in the first degree. Intervals, it is plain, may differ in magnitude, and there may be an infinite variety, according to the possible degree of tune; for there is no difference so great or so little, but a greater or a less

self may possibly be conceived. It is true, with regard to practice, there are limits, which are the greatest and least intervals our ears are judges of, and which may be actually produced by voice or instrument.

The degrees of tune are proportional to the number of vibrations of the sonorous body in a given time, or the velocity of their courses and recourses. Now these differences in tune constitute, as has been already said, the intervals in music; these therefore must be greater or less, as the differences are; and it is the quantity of these which is the subject of the mathematical part of music. Those intervals are measured, not in the simple differences, or in arithmetical ratios of the numbers expressing the lengths or vibrations, but in their geometric ratios; so that the same interval depends on the same geometrical ratio, and *vice versa*. It is, however, to be observed, that in comparing the equality of intervals, the ratios expressing them must be all of one species; otherwise this absurdity will follow, that the same two sounds may make different intervals. To describe the particular methods of measuring the inequality of intervals would be too tedious: this one rule may be observed, that, to determine in general which of two or more intervals are the greatest, take all the ratios as proper fractions, and the least fraction will be the greatest interval.

The ancients were extremely divided about the manner of measuring intervals. Pythagoras and his followers measured them by the ratios of numbers. They supposed the differences of gravity and acuteness to depend on the different velocities of the motion which causes sound; and therefore concluded, that they could only be accurately measured by the ratios of those velocities. Which ratios are said to have been first investigated by Pythagoras, on occasion of his passing by a smith's shop, and observing a concordance betwixt the sounds of hammers striking on the anvil.

Aristoxenus opposed this. He thought reason and mathematics had nothing to do in this case, and that sense was the only judge in the dispute; the other being too subtle to be of any use. He therefore determined the octave, fifth, and fourth, which are the most simple concords, by the ear; and by the difference of the fourth and fifth he found out the tone; which, once settled as an interval the ear could judge of, he pretended to measure every interval by various additions, and subtractions, made of these mentioned, one with another: but this method is very inaccurate.

Ptolemy keeps a middle course betwixt the two: he finds fault with the one for despising reason, and with the other for excluding sense; and shews how these two may mutually assist each other in this matter. Malcolm.

Intervals are founded on certain ratios or proportions expressible in numbers, which may all be analysed into the prime numbers 2, 3, and 5. And all intervals may be found from the octave, fifth, and third major, which respectively correspond to those numbers. These are the musician's elements, from the various combinations of which all the agreeable variety of relations of sounds results.

This is the modern system; and a late author assures us, it may be looked on as the standard of truth; and that every interval that occurs in music is good or bad, as it approaches to or deviates from what it ought to be, on these principles. He observes, that the doctrine of some of the ancients seems different. Ptolemy, for instance, introduces not only the primes 2, 3, 4, 5, but also 7 and 11, &c. Nay, he seems to think all fourths good, provided their component intervals may be expressed by super-particular ratios. But these are justly exploded conceits; and it seems not improbable, that the contradictions of different numerical hypotheses, even in the age of Aristoxenus, and their inconsistency with experience,

might lead him to reject numbers altogether. Dr. Pepusch, ap. Phil. Trans. N^o 481. p. 267, 268.

M. Euler defines an interval, the measure of the difference of an acute and grave sound. Tentamen Novæ Theoriæ Musicæ, p. 72 and p. 103.

Suppose three sounds a , b , c , of which c is the acute, a the most grave, and b the intermediate sound. From the preceding definition it appears, that the interval between the sounds a and c is the aggregate of the intervals between a and b , and between b and c . Therefore, if the interval between a and b be equal to that between b and c , which happens when $a : b :: c : d$, the interval between a to c will be double the interval a to b , or b to c . This being considered, it will appear that intervals ought to be expressed by the measures of the ratios constituting the sounds forming these intervals. But ratios are measured by the logarithms of fractions, the numerators of which denote the acute sounds, and the denominators the grave. Hence the interval between the sounds a and b will be expressed by the logarithm of the fraction $\frac{b}{a}$, which is usually denoted by $l\frac{b}{a}$, or, which

comes to the same, $lb - la$. The interval therefore of equal sounds, a to a , will be null, as $la - la = 0$. The interval called an octave, or diapason, will be expressed by the logarithm of 2: and the interval of the fifth or diapente, will be $l3 - l2$. From whence it appears that these intervals are incommensurable: so that no intervals, however small, can be an aliquot part, both of the octave and fifth. The like may be said of the intervals $l3$, and $l\frac{3}{2}$, and others whose logarithms are dissimilar. But intervals expounded by logarithms of numbers, which are powers of the same root, may be compared. Thus, the interval of the sounds 27:8, will be to the interval of the sounds 9:4, as 3 is to 2: For $l27 = 3l9$, and $l8 = 2l4$. Euler, *ibid.* p. 74.

But though the logarithms of numbers, which are not powers of the same root, be incommensurable, yet an approximating ratio of such may be found. Thus the measure of the octave is $l2 = 0.3010300$, and the measure of the fifth is $l3 - l2 = 0.1760913$. Hence the interval of the octave will be to that of the fifth, nearly as 3010300 to 1760913; which ratio being reduced to smaller terms, in the method explained under the head RATIO, will give us these simple expressions for the ratio of the octave and fifth: 2:1, 3:2, 5:3, 7:4, 12:7, 17:10, 29:17, 41:24, 53:31, which last is very near the truth. Euler, *ibid.* p. 75.

In like manner intervals may be divided into any number of equal parts: for this purpose we need only divide the logarithm of the proposed interval into the same number of parts, and then find its correspondent number by the tables. The ratio of the number so found, to unity, will give the required ratio of the divided interval to its proposed part. Thus let the third part of an octave be required; its logarithm will be $= 0.1003433 = \frac{1}{3}l2$. The ratio corresponding nearly to this will be 63:50, or less accurately, 29:23, or 5:4, which last expresses the third major; and this is by the less knowing taken for the third part of an octave, and seems to be such on our harpichords and organs, where from C to E is a third, from E to G another, and from G to A another third. But the more intelligent know, that G to A and A to C ought not to be reputed the same sound, since they differ by a diesis enharmonica, which is nearly equal to two commas.

M. Euler has inserted a table of intervals in his "Tentamen Novæ Theoriæ Musicæ:" he supposes the logarithm or measure of the octave to be 1.000020, whence the logarithm

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of the fifth will be 0.584962, and the logarithm of the third major will be 0.321928: from these the measures of all other intervals may be found. But as it has been customary for musicians to measure their intervals by commas, we shall here insert a table of intervals, with their measures in commas; where we suppose the logarithm or measure of the comma $\frac{81}{80}$ to be 1.00000: hence the logarithm of the octave $\frac{2}{1}$ will be 55.79763, that of the fifth 32.63952, and lastly, that of the third major 17.96282. From these all the other intervals may be found in the manner expressed in the table; where the first column shews the names of the several intervals; the second, the proportions of sounds forming these intervals; the third, the composition of these proportions from the primes 2, 3, and 5. The smaller figures marked above, and somewhat to the right of the larger, indicate the power to which the number expressed by the larger figures is raised. Thus $\frac{2^{17}3}{5^8}$ shews that the seventeenth power of 2 multiplied by 3, and divided by the eighth power of 5, will produce $\frac{393216}{390625}$ in the second column, and that this is the proportion expressing the interval called *eschaton* in the first column. The fourth column of the table contains some simple signs of some of the intervals, as *b* for *hyperoche*, *d* for *diefis*, &c. and the fifth column shews how the intervals arise from others: thus over again the semitone major, I find in the fourth column *S*, which is here only an arbitrary mark for this semitone; and in the fifth column I find $s + d = IV - III$, which signifies that the semitone major is equal to the sum of the semitone minor and diefis, or to the difference between the fourth and the third major. Observe, that the comma is marked by a dot (\cdot); when this is placed over the letter or other symbol, it signifies that the interval

is supposed to be heightened by a comma; and on the contrary, when the point is placed below, it signifies that the interval must be diminished by a comma; thus $\dot{t} = T$ signifies that the tone minor increased by a comma is equal to a tone-major, and *vice versa*: $T = t$ shews that the tone-major diminished by a comma is equal to the tone-minor. The signs +, -, =, are here taken in the same sense as in algebra, to signify addition, subtraction, and equality. So likewise the dot placed between two numbers, or between a number and the symbol of an interval, signifies that the interval is to be multiplied by the number. Thus 2. IV shews that the fourth is doubled; and thus $7^b = VI + S = 2. IV = VIII - T$, shews, that the lesser flat seventh is equal to the sixth major and semitone-major, or also to two fourths, or to the octave when the tone-major has been taken from it. Lastly, the sixth column of the table shews the measures, or logarithms of the ratios in the second column. These are not the common logarithms of the tables where 1.0000000 is the logarithm of 10. But here 1.00000 is assumed as the logarithm of $\frac{81}{80}$, or of the comma, as before mentioned. These logarithms are easily derived from the common, of the large tables of Vlacq, or Briggs; thus the logarithm of 2, or the octave = 0.3010299957; the logarithm of $\frac{3}{2}$, or of the fifth = 0.1760912590: and lastly, the logarithm of $\frac{4}{3}$, or of the third major = 0.0969100130. Now these logarithms being severally divided by the logarithm of $\frac{81}{80}$, or the comma = 0.0053950139; the quotients will give the number of commas in an octave = 55.79763; in a fifth = 32.63952; and in a third major = 17.96282. Hence all the rest may be found by addition and subtraction only. Here follows the Table.

A TABLE of the Musical Intervals with their Measures.

Names of the Intervals.	Proportions expressing the Inter- vals	Composition of the Pro- portions from 2, 3, and 5.	Simple Signs.	Complex Signs to shew the Composition of Intervals.	Measures by Commās.
Eschaton of Henfling - -	$\frac{393216}{390625}$	$\frac{2^{17}3}{5^8}$		$\dot{I} - b = 2d - s = 3d - S$	0.53222
Diaschisma of Euler - - -	$\frac{2048}{2025}$	$\frac{2^{11}}{3^4 5^2}$		\dot{I}	0.90917
Comma - - - - -	$\frac{81}{80}$	$\frac{3^4}{2^4 5}$		$T - t$	1.00000
Comma of Pythagoras - - -	$\frac{531441}{524288}$	$\frac{3^{12}}{2^{19}}$		$6T - VIII$	1.09083
Hyperoche - - - - -	$\frac{3^{125}}{3072}$	$\frac{5^5}{2^{10}3}$	<i>b</i>	$s - d = S - 2d$	1.37695
Enharmonic Diefis, or diminished second	$\frac{128}{125}$	$\frac{2^7}{5^3}$	<i>d</i>	$S - s$	1.90917
Semi-toned Minor, or least Chromatic } Diefis - - - - - }	$\frac{25}{24}$	$\frac{5^2}{2^3 3}$	<i>s</i>	$t - S = d + b = III - 3^b$	3.28612

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Names of the Intervals.	Proportions expressing the Inter- vals.	Composition of the Pro- portions from 2, 3, and 5.	Simple Signs.	Complex Signs to shew the Composition of Intervals.	Measures by Commas.
Limma of the Greek scale, or de- ficient Semitone Major - - - }	$\frac{256}{243}$	$\frac{2^3}{3^5}$		$S = IV - 2 T$	4.19529
Lesser Limma, or redundant Semi- tone Minor - - - }	$\frac{135}{128}$	$\frac{3^3 \cdot 5}{2^7}$		$s = T - S$	4.28612
Semitone Major - - - -	$\frac{16}{15}$	$\frac{2^4}{3 \cdot 5}$	S	$s + d = IV - III$	5.19529
Apotome of the Greek scale - -	$\frac{2187}{2048}$	$\frac{3^7}{2^{11}}$		$T - S = s$	5.28612
Greater Limma, or redundant Semi- tone Major - - - }	$\frac{27}{25}$	$\frac{3^3}{5^2}$		$\dot{S} = T \quad s$	6.19529
Double Semitone Minor - - -	$\frac{625}{576}$	$\frac{5^4}{2^6 \cdot 3^2}$		$2 s = t - d$	6.57224
Greatest Limma, or redundant double Semitone Minor - - - }	$\frac{1125}{1024}$	$\frac{3^3 \cdot 5^3}{2^{10}}$		$s + \dot{s} = T - d$	7.57224
Tone Minor - - - - -	$\frac{10}{9}$	$\frac{2 \cdot 5}{3^2}$	t	$S + s = T = IV - 3^b = \}$ $III - T$	8.48141
Tone Major - - - - -	$\frac{9}{8}$	$\frac{3^2}{2^3}$	T	$\dot{t} = V - IV$	9.48141
Diminished Third - - - - }	$\frac{256}{225}$	$\frac{2^3}{3^2 \cdot 5^2}$		$t + d = 2 S$	10.39058
	$\frac{144}{125}$	$\frac{2^4 \cdot 3^2}{5^3}$		$T + d = 3^b - s$	11.39058
	$\frac{125}{108}$	$\frac{5^3}{2^3 \cdot 3^3}$		$t + s$	11.76753
	$\frac{75}{64}$	$\frac{3 \cdot 5^2}{2^6}$		$T + s = 3^b - d$	12.76753
Trihemitone of the Greek scale, or deficient Third Minor - - - }	$\frac{32}{27}$	$\frac{2^5}{3^3}$		$3^b = t + S = IV - T$	13.67670
Third Minor - - - - -	$\frac{6}{5}$	$\frac{2 \cdot 3}{5}$	3 ^b	$T + S = V - III$	14.67670
Trihemitone Major - - - - -	$\frac{4096}{3375}$	$\frac{2^{12}}{3^3 \cdot 5^4}$		$3 S = T + S + d$	15.58587

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Extreme diminished Fourth . . .	$\frac{768}{625}$	$\frac{2^8 \ 3}{5^4}$		$3^b + d = IV - 2 s$	16.58587
Third Major	$\frac{5}{4}$	$\frac{5}{2^2}$	III	$III = V - 3^b$	17.96282
Ditonus of the Greek Scale, or re- dundant Third Major . . . }	$\frac{81}{64}$	$\frac{3^4}{2^6}$		$III = 2 T$	18.96282
Diminished Fourth	$\frac{3^2}{2^5}$	$\frac{2^5}{5^2}$		$III + d = IV - s$	19.87199
Superfluous Third	$\frac{96}{96}$	$\frac{5^1}{2^5 \ 3}$		$III + \dot{s}$	21.24894
Fourth	$\frac{4}{3}$	$\frac{2^2}{3}$	IV	$III + S = VIII - V$	23.15811
Redundant Fourth	$\frac{27}{20}$	$\frac{3^3}{2^2 \ 5}$		$IV = 3^b + T$	24.15811
Superfluous Fourth	$\frac{25}{18}$	$\frac{5^2}{2 \cdot 3^2}$		$IV + s$	26.44423
Semi-diapente of the Greek scale . .	$\frac{1024}{729}$	$\frac{2^{10}}{3^6}$		$IV + S$	27.35340
Tritonus, or false Fourth	$\frac{45}{32}$	$\frac{3^2 \ 5}{2^5}$		$IV + \dot{s} = V - S$	27.44423
Semi-diapente, or false Fifth	$\frac{64}{45}$	$\frac{2^6}{3^2 \ 5}$		$IV + S. = V - s$	28.35340
Tritonus of the Greek Scale	$\frac{723}{12}$	$\frac{3^6}{2^7}$		$3 T = V - S = IV + \ddot{s}$	28.44423
Diminished Fifth	$\frac{36}{25}$	$\frac{2^2 \ 3^2}{5^2}$		$V - s = 2 \cdot 3^b$	29.35340
Deficient Fifth	$\frac{40}{27}$	$\frac{2^3 \ 5}{3^3}$		$V = IV + \dot{s}$	31.63952
Fifth	$\frac{3}{2}$	$\frac{3}{2}$	V	$V + T = III + 3$	32.63952
Superfluous Fifth	$\frac{25}{16}$	$\frac{5^2}{2^4}$		$V + \dot{s} = 2 \cdot III$	35.92564

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A TABLE of the Musical Intervals with their Measures.

Names of Intervals.	Proportions expressing the Inter- vals.	Composition of the Pro- portions from 2, 3, and 5.	Simple Signs.	Complex Signs to shew the Composition of Intervals.	Measures by Commās.
Sixth Minor - - - - -	$\frac{8}{5}$	$\frac{2^3}{5}$	6 ^b	V + S = VIII - III	37.83481
Sixth Major - - - - -	$\frac{5}{3}$	$\frac{5}{3}$	VI	V + t = VIII - 3 ^b	41.12093
Hexachord of the Greek Scale, or } redundant Sixth Major - - - }	$\frac{27}{16}$	$\frac{3^3}{2^4}$		VI = V + T = VIII - 3 ^b	42.12093
Lesser } Greater } diminished Seventh - {	$\frac{128}{75}$	$\frac{2^7}{3 \cdot 5^2}$		6 ^b + S = 2 . IV - s = }	43.03010
	$\frac{216}{125}$	$\frac{2^3 \cdot 3^3}{5^3}$		6 ^b + S = 7 ^b - s	44.63010
	$\frac{125}{72}$	$\frac{5^3}{2^3 \cdot 3^2}$		VI + s	44.40705
	$\frac{225}{128}$	$\frac{3^2 \cdot 5^2}{2^7}$		VI + s = VIII - 2 S	45.40705
Lesser } Greater } superfluous Sixth - {	$\frac{16}{9}$	$\frac{2^4}{3^2}$	7 ^b	VI + S = 2 . IV = VIII - T	46.31622
	$\frac{9}{5}$	$\frac{3^2}{5}$	7 ^b	VI + S = V + 3 ^b = }	47.31622
	$\frac{15}{8}$	$\frac{3 \cdot 5}{2^3}$	VII	VI + T = VIII - S	50.60234
	$\frac{48}{25}$	$\frac{2^4 \cdot 3}{5^2}$		VII + d = VIII - s	52.51151
Diminished Octave - - - - -	$\frac{125}{64}$	$\frac{5^3}{2^6}$		VII + s = VIII - d	53.88846
Superfluous Seventh - - - - -	$\frac{2}{1}$	$\frac{2}{1}$	VIII	VIII = V + IV	55.79763
Octave - - - - -					

The limma, apotome, trihemitone, ditonus, femidiapente, and tritonus, mentioned in this table, by the names of limma, apotome, &c. of the Greek scale, are such as are either mentioned by the ancients, or at least occur in their scale, where fourths are divided into two tones and a limma, and where the octave consisted of five tones and two limmas.

The term *redundant*, in the table, is applied to such intervals as exceed the truth by a comma; and such as fall short of the truth by a like quantity, are called *deficient*. Intervals that exceed true diatonic intervals, by a semitone

minor, are said to be *superfluous*; and those which fall short by the same quantity, are said to be *diminished*. Where an interval exceeds a true diatonic interval by the quantity of two semitones minor, we have called it an *extreme superfluous* interval: and if it falls short by the same quantity, the appellation of *extreme diminished* interval is given it. Thus, if from A to D ascending be a true fourth, and from D to a a true fifth, then if D be supposed raised by a comma, from A to D will be a redundant fourth, and from D to a a deficient fifth. From A to D * will be a superfluous fourth, and

and from D^{\times} to a will be a diminished fifth. In like manner, from A to D^b , will be a diminished fourth; and from D^b to a a superfluous fifth. From A to $D^{\times\times}$ (D double sharp) will be an extreme superfluous fourth, and from A to D^{bb} (D double flat) will be an extreme diminished fourth. In like manner from $D^{\times\times}$ to a will be an extreme diminished, and from D^{bb} to a an extreme superfluous fifth. Such intervals are not to be met with in the practice of music; but if the division of the octave into 31 parts were once established, as it ought for the perfection of music, such intervals as these here mentioned will necessarily occur in the scale. Vide Phil. Trans. N^o 481. p. 273, 274. See GENUS.

This table, among other uses, will facilitate the examination of any proposed scale, or interval. Suppose, for instance, it were required to examine some of Ptolemy's divisions of the fourth, as his diatonicum molle, which he makes $\frac{1}{2} + \frac{1}{6} + \frac{1}{3} = \frac{1}{2}$. Take the logarithm of $\frac{1}{2}$ from the common tables, and divide it by the logarithm of $\frac{3}{8}$, the quotient will be 10.75, which gives the measure or number of commas, and its parts contained in an interval expressed by $\frac{1}{2}$. Look for the nearest measure of intervals to 10.75 in the table, it will be found to be 10.39058, which answers to the interval of two semitones major, or of the diminished third, as practitioners call it. But Ptolemy's exceeds this by 0.36, or about $\frac{1}{3}$ of a comma. The next interval in Ptolemy's division is $\frac{1}{3}$, which is a true tone minor. The third is $\frac{2}{3}$, which will be found to be 3.93 commas, that is, a semitone minor and 0.64 of a comma, or a semitone minor redundant by near $\frac{2}{3}$ of a comma. But this is much out of tune. In the common, and in Huygens's temperatures, the semitone minor is increased only by about $\frac{1}{4}$ th of a comma. Vide Ptolemy's Harmon. p. 92. apud Wallis Opera, tom. v.

INTERVALS, Concinuous. Discords are distinguished into *concinuous* and *inconcinuous* intervals: the *concinuous* are such as are fit for music, next to, and in combination with concords; being neither very agreeable nor disagreeable in themselves; but having a good effect, as by their opposition they heighten the more essential principles of pleasure; or as by their mixture and combination with them, they produce a variety necessary to our being better pleased. See CONCINNOUS.

The other discords that are never used in music, are called *inconcinuous*.

INTERVAL, Diminished, is a defective interval, or an interval which is short of its just quantity by a lesser semitone. Thus from C \sharp to E being a third major, if E be lowered by a semitone minor, we shall have E^b , and then from C \sharp to E^b is called a *diminished* third, in the language of practical musicians, and occurs frequently in their works. But, strictly speaking, in this case, the note E must be lowered more than a semitone minor.

INTERVAL, Harmonical, is an interval, or difference of two sounds which are agreeable to the ear, whether in consonance or succession.

Harmonical intervals, therefore, are the same with *concinuous*; which see.

They are thus called, as being the only essential ingredients of harmony.

INTERVALS, in the New Method of Husbandry, denote the wide spaces, commonly about five feet, which are left between any two of the double, treble, or quadruple rows. See HUSBANDRY.

INTERVALS, in the Military Art, are the spaces left between each regiment in camp, and likewise between each tent.

INTESTATE, a person who dies without making a will. An heir *ab intestato*, is a person who inherits an estate by some other right than that of will or testament.

Heretofore, those who died intestate, were held infamous, and accursed; in regard, by the canons of several councils, every person was enjoined to bequeath a part of his estate (and Matthew Paris says it was at least to be a tenth part) to the church, for the safety of his soul; which a person who neglected to make a will, and to leave this legacy to the church, was judged to have abandoned. Several councils took on them to command the priests to solicit dying persons to be charitable to the church; and this they did so earnestly, that absolution and the viaticum were denied to those whom they could not prevail on; so that they made no difference between these intestates and self-murderers; and they were alike denied Christian burial. Du Cange adds, that all who died without absolution, without receiving the viaticum, and without leaving alms to the church (even though they died suddenly), had their effects seized, and confiscated to the use of the church, bishop, &c. See ADMINISTRATOR and TESTAMENT.

In the English law there are two kinds of intestates: the one *de facto*, which are those who make no will at all; the other *de jure*, called also *quasi intestati*, which are those who make a will; but such an one as is null and void, either from the executors refusing to act, or from some other cause: in which case they are judged to die as intestate, *quasi intestati*.

And the 22 & 23 Car. II. c. 10. commonly called the statute of distribution, appoints a distribution of intestates' estates, (except of femes covert, which are left as at common law, stat. 29 Car. II. c. 3. § 25.) after debts and funeral expences are paid among the wife and children of the deceased; or for want of such, among the next of kin, &c. and the act of parliament doth immediately upon the death of the intestate vest an interest in the persons entitled: so that if any one dies before the distribution, though within the year, his share shall go to his executors and administrators; and not to the survivors or next of kin to the intestate. (1 Lil. Abr. 487. See ADMINISTRATION.) By this statute the mother, as well as the father, succeeded to all the personal effects of their children who died intestate, and without wife or issue: in exclusion of the other sons and daughters, the brothers and sisters of the deceased. And so the law still remains with respect to the father; but by statute 1 Jac. II. c. 17, if the father is dead, and any of the children die intestate without wife or issue, in the life-time of the mother, she and each of the remaining children, or their representatives, shall divide his effects in equal portions. See CUSTOM of LONDON.

By the same statute it is enacted, that one-third part of the surplusage of the estate of any person dying intestate, shall be distributed to his widow, and the residue amongst his children by equal portions, or among such persons as legally represent his children, in case any of them be then dead, excepting such child or children (not being heir at law) who shall have any estate by the settlement of the intestate, or shall be advanced by the intestate in his life-time, by portion or portions equal to the share which shall by such distribution be allotted to the other children, and in case their portions have not been equal, they shall be made so as nearly as possible out of the same surplusage. But the heir at law is to have an equal part in the distribution with the rest of the children, without any consideration of the value of the land which he hath by descent or otherwise from the intestate. In case there be no children nor legal representatives, one moiety of the said estate shall be allotted to the widow of the

the intestate, and the residue distributed equally to every of the next kindred of the intestate, who are in equal degree, and those who legally represent them; provided that there be no representations admitted among collaterals, after brothers and sisters children: and if there be no widow, the said estate shall be wholly distributed in equal shares among the children; or if there be no child, to the next of kindred in equal degree, and their legal representatives. But no such distribution of the goods of an intestate should be made till after one year be fully expired after his death, and those to whom distribution is made, are required to give bonds with sufficient sureties, to refund in case of debts.

This statute of distributions bears a near resemblance to our ancient English law, "de rationabili parte bonorum," which sir Edward Coke himself (2 Inst. 33.), though he doubted the generality of its restraint on the power of devising by will, held to be universally binding (in point of conscience at least) upon the administrator or executor, in the case of either a total or partial intestacy. It also bears some resemblance to the Roman law of succession "ab intestato;" which, and because the act was also penned by an eminent civilian (sir Walter Walker), has occasioned a notion that the parliament of England copied it from the Roman prætor, though it is little more than a restoration, with some refinements and regulations, of our old constitutional law; which prevailed as an established right and custom from the time of king Canute downwards, many centuries before Justinian's laws were known or heard of in the western parts of Europe. Judge Blackstone observes, however, that the doctrine and limits of representation, laid down in the statute of distributions, seems to have been principally borrowed from the civil law; whereby it will sometimes happen that personal estates are divided "per capita," and sometimes "per stirpes;" whereas the common law knows no other rule of succession but that "per stirpes" only. Bl. Com. b. ii.

INTESTINA, in the *Linnean System*, an order or division of worms (see VERMES); the characters of which are, that they are simple naked animals without limbs: some are pierced with a lateral hole or a kind of pore; and others are imperforated and have no lateral pore. The subordinate genera of this division of worms are the *ascaris*, *trichocephalus*, *uncinaria*, *tilaria*, *scælex*, *ligula*, *linguata*, *strongylus*, *echinorhynchus*, *heruca*, *cucullanus*, *caryophyllæus*, *fasciola*, *myxine*, *tenia*, *furia*, *gordius*, *hirudo*, *lumbricus*, *spunculus*, and *planaria*.

INTESTINE MOTION. See MOTION.

INTESTINE War. See WAR.

INTESTINES, in *Anatomy*, are portions of the membranous tube, in which the conversion of the food into chyle, and the expulsion of its residue in the form of feces is effected. They are two in number, and are distinguished by epithets derived from their relative size; the *small intestine* (*int. tenue*) succeeds the stomach, and is immediately followed by the *large* (*int. crassum*). The use of the word in the plural, with either of these epithets, is incorrect; since each of these divisions of the alimentary canal is a single tube.

The changes which the food undergoes in the stomach and intestines, and the functions of these organs, have been fully discussed under the article DIGESTION: at present our object is merely anatomical, and consists in presenting to the reader the details concerning the forms, situation, connections, and structure of the intestines.

The small intestine is that part of the alimentary canal which extends from the pylorus to the valve of the colon. It is the longest division of the canal, and is supposed to be three or four times the length of the body. It is naturally divided into two parts: the first of these, placed between

the two layers of the transverse mesocolon, has a fixed situation in the abdominal cavity, and is called *duodenum*: the other floats loosely in the abdomen, and is distinguished by an ambiguous and arbitrary division into jejunum and ileum. It is generally, but not always, smaller in size than the large intestine; yet, when it is distended with air or other contents, it exceeds the empty large intestine in diameter. The cells and folds of the latter give to its coats in the collapsed state a feel of greater thickness, although they are not actually thicker than some parts of the small intestines. A superficial view would lead us to describe it as a cylindrical tube; but more accurate examination and actual measurement will shew that it is conical, largest at its commencement, smallest at its termination, and diminishing very gradually between these points. When distended, the outline of its section is circular: in the empty state its sides fall together, so that it represents an oblong oval.

The structure of the tube is the same, in all essential points, throughout its whole extent; and the distinctions of anatomists regard only points of situation and connection. The excretory tubes of the liver and pancreas open into the canal, near its beginning.

The *duodenum* is that part of the intestine included between the pylorus and the point at which the canal escapes from the transverse mesocolon. It is placed in the neighbourhood of the vertebral column, between the two layers of the mesocolon, which are connected to it by a loose cellular substance. The large end of the pancreas is very closely attached to it. From the pylorus it turns backwards, and to the right, under the neck of the gall-bladder, which touches it: hence it frequently has a yellow tint in the dead subject. This, which may be called the first portion of the duodenum, forms a distinct angle with the second, which descends almost perpendicularly behind the upper layer of the mesocolon connected to it by a loose cellular medium. Its posterior surface corresponds to the right side of the vertebral column, and to the front of the right kidney: its inner edge to the pancreas. The third part makes a turn at the lower end of the kidney, or about the third lumbar vertebra, passes from right to left across the vertebral column, in front of the aorta and vena cava, behind the superior mesenteric vessels, and below the pancreas. At the left side of the abdomen it again turns forwards and towards the right, escapes from behind the inferior layer of the mesocolon, and takes the name of jejunum. Thus this division of the intestinal canal forms a kind of half circle, of which the convexity is towards the right, and the concavity to the left: the pancreas is included within it.

The anterior surface of the intestine only is covered by peritoneum; the posterior aspect being attached to the neighbouring organs by cellular substance. In the part near the pylorus, the covering membrane adheres closely to the muscular part of the intestine, as it does in the jejunum or ileum: but in the rest of its course, the adhesion is much more loose, and in the third portion the mesenteric vessels are interposed between the membrane and the intestine. A fold of membrane produced from the neighbourhood of the right kidney, and from the transverse fissure of the liver, is sometimes described as the ligamentum duodeni renale or hepaticum: the rest of the canal is included within the space left between the layers of the mesocolon.

Its length is about that of twelve fingers' breadths. The united pancreatic and biliary ducts have their opening on the posterior surface, at the angle formed between the first and second portions of the duodenum.

The peculiarities of the duodenum are its incomplete peritoneal covering; its circumscribed and fixed situation; its

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its connection to the pancreas, and receiving the secreted fluid of that gland and the liver. Its figure is perhaps less regularly cylindrical, and there are some differences in the mucous membrane.

• The arteries of the duodenum are derived from the gastroduodenal branch of the hepatic, and from the superior mesenteric: the veins join some of the trunks, which contributed to the formation of the vena portarum. The absorbing vessels pass to the glands at the root of the mesentery. The nerves come from the celiac ganglia.

Second Division of the small Intestines.—This part of the canal, which is very loose and moveable, forms numerous turns, and its convolutions fill up the space between the bladder and uterus below, and the large intestine above and at the sides: the latter part almost encircles the space in which this division of the canal lies. As the cæcum and the sigmoid flexures of the colon do not touch below, the small intestine descends in their interval, in greater or less quantity, into the pelvis. The umbilical and hypogastric regions of the abdomen are chiefly occupied by these convolutions: which accommodate themselves, by their perfect mobility, to the numerous changes produced in this space. A distended state of the stomach causes them to descend: when the bladder, rectum, and uterus are empty, much of the intestine is found in the pelvis; but when these organs, and particularly the latter, are distended, the intestine ascends: in a word, it passes into any space that remains open for it. The transverse arch of the colon bounds the space occupied by the small intestine above: the lumbar portions of the large intestine, fixed to the back of the abdomen, allow the convolutions to pass in front of them, and to correspond immediately to the abdominal parietes. The latter limit and confine it in front, and are separated from it only by the great omentum.

A broad fold of peritoneum, called the mesentery, connects it in its situation to the abdominal cavity; this consists of two layers, which receive the intestine between them, and give it a smooth external coat. This fold is attached to the back of the abdomen, in an oblique line, extending from the left lumbar to the right iliac regions: here it is about six inches broad. It expands so considerably as to be broad enough on the opposite or front margin, to be attached to the whole length of the jejunum and ileum. In consequence of this great breadth of the anterior part, the mesentery itself, in this situation, forms a vast number of longitudinal plaits. The flat surfaces of the mesentery are smooth, and contiguous to the intestinal convolutions. The depth of the mesentery, from its posterior or fixed, to its anterior or loose edge, is greatest in the middle, and gradually diminished towards either end. Its structure and attachments are such as to preserve the intestinal convolutions in a certain relative position, and at the same time to allow in the whole a considerable liberty of motion; it prevents the intestines also from becoming entangled in the motions of its individual parts.

It is composed of two membranous layers, produced from the peritoneum. The latter membrane, after lining the posterior and right portion of the abdomen, when it arrives at the root of the mesentery, is reflected from behind forwards, instead of being continued to the left side. That, which has lined the posterior and left division of the cavity, is also reflected from behind forwards, instead of passing in front of the vertebrae. These laminae, turned towards each other, form the two surfaces of the mesentery; they separate at the intestine, and leave a cylindrical tube, in which that canal is contained. They are connected by a layer of cellular membrane, containing more or less feet, and the ar-

teries, veins, and nerves of the jejunum and ileum, as well as the lacteal vessels and their glands.

The intestinal convolutions have no fixed situation, but are formed, destroyed, and renewed, carried upwards, downwards, &c. according to the general or particular motions of the canal: yet the concavity of each turn is always at the mesenteric edge, and its convexity at the loose margin of the gut. The very loose attachment to the sides of the cavity, and the apparently irregular order in which the convolutions of the intestines are disposed, seem at first sight to prevent us from assigning any particular direction to this part of the canal. But if we put out of the question the great mass of the turns, and examine the parts where it begins and ends, and consider at the same time the direction of the mesentery, we shall find that the canal altogether passes obliquely from above downwards, and from the left towards the right side. It begins in fact on the left side of the transverse mesocolon below the superior mesenteric vessels, and it terminates in the right iliac region, where it is fixed to the side of the cæcum.

A transverse section of the intestine presents an elliptical area; of which the smaller circle corresponds to the mesentery, and the larger to the loose edge of the intestine. Considered in its whole length, the mesenteric or attached edge is concave; the loose margin convex. The small trunks of the blood-vessels enter on the former; their minute ramifications, and the fine origins of the absorbents, are observed on the latter.

Sometimes small blind processes, or appendices, varying in length from a few lines to three or four inches, are connected to the small intestine. It is very uncommon to see more than one in a subject. They are cylindrical or conical towards the extremity, communicate freely with the rest of the canal, and completely agree with it in structure. There can be no doubt that they are originally formed parts, and not produced by any morbid extension of the intestinal parietes. They are often mentioned under the name of diverticula.

When moderately distended, the intestine measures more than an inch at its largest diameter, and less at the smallest. When it is completely distended, the figure is circular.

The coats are thinner than in the stomach or in the large intestine: they are thickest at the beginning, and grow gradually thinner to the end. They appear proportionally thicker, when the intestine is in a contracted state. It is more fleshy, elastic, and dark coloured; in a word, firmer and thicker in perfectly healthy men than in women or valetudinarians. When it is asserted that the canal is so many times the length of the body, we only mean to give a general notion of its extent: for there is no relation between the stature of individuals and the volume of their gastric viscera.

The distinction of the jejunum and ileum is quite arbitrary: there are no marks shewing the termination of one, and the beginning of the other: but the two ends of the canal differ obviously in several points. Winslow gives the former name to the upper two-fifths of the tube, and the latter to the lower three-fifths.

Organization of the small Intestine.—It consists, like the stomach, of three distinct strata or coats, connected by cellular substance: these are most clearly seen on the cut edge of the part, after a simple incision, when the difference of colour and density enables us to distinguish them easily. Boiling and maceration in proof spirit render the dissection of the intestinal coats more easy.

The first or external coat is a serous membrane, consisting

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of a production of peritoneum. The two layers of the mesentery separate at the concave edge of the intestine, surround it, and are continued into each other at the convex side. It covers, therefore, the whole external surface, excepting the narrow strip where the two layers are separated.

This serous membrane is very thin, so as to be nearly transparent, and possesses no fibres: the muscular fibres and the blood-vessels can be seen through it. Its external surface is moist, and perfectly smooth; while the internal, connected to the subjacent fibres by cellular substance, has a rough appearance.

The muscular or second coat of the intestine consists of two strata of fibres. The external, which is thin and small, has a longitudinal direction, but their fibres can hardly be seen except at the convex edge of the gut. The internal is much more considerable; its fibres are more numerous, and they surround the intestine in a circular manner, so as to cut the former at right angles. These fibres are the most distinctly marked about the duodenum: they grow more slender, possess less colour, and are therefore hardly observable near the valve of the colon.

The third or internal covering is a mucous membrane, generally called by anatomists the villous coat of the intestine: it is always covered in a greater or less degree with a mucous fluid. This is connected to the muscular stratum by a very copious, white, and rather loose cellular substance, the *nervous* coat of many anatomists. The trunks of the blood-vessels and absorbents of the mucous surface are contained in this in great numbers, and give to it the appearance of considerable vascularity. It not only connects the mucous and muscular coverings together, but also unites the duplicatures of the former. Through the intervals of the muscular fibres it joins the cellular substance connecting the serous and muscular coats. When carefully separated, it has the appearance of a fine cotton on both surfaces: and this appearance may be still more strikingly produced by cutting off the mesentery close to the intestine, inverting the tube and inflating it forcibly, when the air will penetrate into the whole cellular structure of the organ. If the part be macerated, after separating by dissection the mucous and muscular coats, the water distends the cells and exhibits the structure very clearly.

The mucous membrane is much longer than the two other coats, and it is consequently collected, throughout the whole canal, into folds, by which the difference of length is compensated. These are not like the rugæ of the stomach, formed only in the contracted, and disappearing in the distended state of the organ; but they belong to the essential structure of the part, and exist therefore under all circumstances. They are mostly transverse in their direction; that is, they cut the long axis of the gut at right angles; and they are called *valvulæ conniventes*, although they have not, nor can possibly exert any thing like the action of a valve. They begin about an inch from the pylorus, are small, and longitudinally disposed in the duodenum. They then assume a more regular arrangement, are numerous and large, and nearly parallel; towards the end of the intestine they gradually become smaller and fewer, and have again in great part of the ileum a longitudinal disposition. Near the valve of the colon the gut is almost smooth.

The *valvulæ conniventes* may occupy from one to three-fourths of the diameter of the canal, but rarely extend through the whole circle: they are often joined by small communicating folds, and frequently are bifurcated at their extremities. When short, they are narrow, and are broader in proportion as they are longer: they are broadest in the middle and narrower at the extremities. Their breadth may

be from half a line to three lines. They are so completely unresisting, that they yield readily in either direction to any impelling force, and are applied against the surface of the canal. As they depend entirely on the cellular substance, they are destroyed by separating the mucous membrane and drawing it out: the surface then becomes smooth, and very much exceeds the length of the other coats.

The situation, length and breadth, direction, number and form of the *valvulæ conniventes*, can be very well observed in a gut inflated and dried; but their natural appearance, their thickness, softness, &c. are best seen in an inverted intestine floating in water.

When the surface of the mucous membrane is attentively examined, it is found universally covered with very delicate and minute folds and projections, so as to give it a flocculent appearance; these are named villi. They are more numerous and large in the commencement of the canal, and decrease in number and size towards the opposite end. In some animals, as the dog, these villi are remarkably long and numerous, so that the surface of the mucous membrane completely resembles velvet.

When the blood-vessels have been successfully injected, microscopical examination discovers other irregularities on these villi, and shews us that the whole consists of a close net-work of vascular communications. Each villus contains moreover numerous absorbing vessels, so that they have been regarded as the great organs of absorption, containing the mouths by which the lacteals take up the chyle from the intestine. Anatomists have busied themselves much with attempts to detect the actual openings of the lacteals upon the villi. Lieberkuhn thought that he could see, by the aid of the microscope, an opening into each villus leading into a small vesicular cavity in the centre, which he called the ampulla. Hewson did not admit this structure, but conceived that the vessels begin by simple apertures, in the number of one or more on each villus. Mr. Cruikshank met with a subject, in which the lacteals and villi were remarkably loaded with chyle, and he examined these parts with the microscope. Many of the villi were so full that they seemed like white vesicles, without any distinction of particular vessels. "In some hundred villi," says he, "I saw a trunk of a lacteal, forming or beginning by radiated branches. The orifices of these radii were very distinct on the surface of the villus, as well as the radii themselves, seen through the external surface, passing into the trunk of the lacteal: they were full of a white fluid. There was but one of these trunks in each villus. The orifices on the villi of the jejunum, as doctor Hunter himself said, (when I asked him, as he viewed them in the microscope, how many he thought there might be,) were about fifteen or twenty on each villus: and in some I saw them still more numerous." *Anatomy of the Absorbing Vessels*, chap. 11, and plate 2.

It has been calculated, that the surface of this mucous membrane, when allowance is made for all its inequalities, exceeds that of the common integuments.

Numerous mucous glands are situated on the external surface of the mucous membrane of the small intestine: their ducts open on the internal surface of the organ. These parts are always small, and in many cases are not demonstrated without some difficulty. They are most advantageously examined by slitting up the gut, and holding it against the light; they are distinguished by their comparative opacity. Several exist in the duodenum; in the jejunum they are fewer, but they increase in number again in the ileum, are collected into considerable masses, and are particularly numerous towards the end of the intestine. They

vary

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vary in size: some are rounded, others compressed; the larger are generally placed singly, the smaller are placed close together in collections of different extent. The openings of the excretory ducts of the larger ones on the mucous surface of the intestine are sufficiently conspicuous. They seem to possess a very simple structure; we can observe in them merely a net-work of minute vascular ramifications, which deposit their secreted mucus in a simple excretory tube.

According as these bodies are found single, or in collections, they have been called *glandulæ solitariae* or *agminatae*. Again, they have been named in different parts, after persons who first described them, *glandulæ Peyerii* and *Brunneri*.

The arteries of the jejunum and ileum are derived from the trunk of the superior mesenteric: the veins all end in the mesenteric root of the vena portarum. The blood in these veins has been observed to have white streaks in it; but this is not peculiar to the mesenteric vessels. Fluids injected into the mesenteric veins easily transude on the mucous surface of the intestine.

The superficial absorbing vessels have their origin in the serous membrane, anastomose very frequently with each other, and with the deep-seated ones, pass through the mesentery in a superior and inferior set, and enter the mesenteric glands. The deeper-seated absorbents, arising from the villi of the mucous surface, are called the lacteal or chyloferous vessels; they are often distended in a varicose manner to a considerable size: their trunks accompany those of the blood-vessels in the cellular substance on the surface of the mucous membrane, anastomose very frequently with each other, and with the superficial ones, both here and in the mesentery, so as to form a complete net-work, and then proceed to the glands. They are very numerous in the duodenum and jejunum; but are fewer in the rest of the canal; they form a plexus in the mesentery, proceed from gland to gland, becoming larger and larger, and still communicating together. Collected into large trunks, they arrive at the under and back surface of the pancreas, and are united with the absorbing vessels of the stomach, spleen, and liver in the glands and plexuses situated about this part. They then bend downwards, forming new plexuses, and arrive at the glands placed about the aorta, uniting with all the trunks from the other abdominal viscera, from the pelvis and lower extremities: they then ascend again to terminate in the thoracic duct.

The mesenteric glands, amounting in number to one hundred or more, even to one hundred and fifty, are chiefly placed on the superior mesenteric artery, either scattered and separated, or in a more close arrangement. They are fewer and smaller towards the lower part and right portion of the mesentery and intestine, than on the upper and left part. They are mostly flattened, with a round or oval circumference: and the larger are placed irregularly among the small ones. They have a brownish red colour, but are paler and smaller in adults than in infants. When full of chyle they are whiter.

The nerves of the small intestine are derived from the cæliac ganglia; they form net-works adhering very closely to the arteries. The animal sensibility of the intestines is probably very slight under ordinary circumstances; the functions of these parts are performed without our consciousness. Disease, however, develops a most acute animal sensibility. Animal contractility is entirely deficient: no exertion of the will can either accelerate or retard the action of the intestine. But the most striking phenomena of the intestinal functions are derived from their organic sensible con-

tractility, which resides in their muscular coat; these may be witnessed in living animals by exposing the abdomen, or in those recently dead, and sometimes in the intestines exposed by accident or surgical operations. The whole canal is observed to be in motion, and this is called *peristaltic*, which term signifies merely contracting. One part of the tube is seen to be contracted, while another is dilated; one ascends, while another descends; one is extended, another rendered shorter: thus a general twisting and creeping is produced, compared to the motion of worms, and hence called *vermicular*. Touch a part of the gut with a sharp instrument, or with any chemical stimulus, and it will be so contracted as to close the canal. A similar effect follows the application of stimuli, such as air, or other fluids, to the internal surface. This is not confined to the mere spot irritated, but the neighbouring parts partake of the affection. This sensibility continues some time after death, and is manifested even in the intestine when removed from the body.

The ordinary and natural stimuli, by which the organic contractility of the intestine is excited, are, the chyme or aliment as it comes from the stomach, the air mixed with and accompanying this, and the bile. The artificial and unusual ones are purgative medicines, worms, cold applied to the abdomen. Cold to the feet, and terror sometimes act sympathetically.

Physiologists have distinguished three kinds of motion in the intestine; the descending or regular one, proceeding from the stomach to the large intestine; the ascending or inverted, the reverse of the former; and the mixed, which partakes of both these.

The following phenomena may be observed in the motion of the intestine. Parts of the canal are alternately distended and contracted; moved in various directions; rendered tense and loose to the touch; distended with air or chyme; incurvated or extended; appear longer or shorter according as the longitudinal or circular fibres act; are filled or emptied; in short, they are alternately at rest and in motion.

The longitudinal fibres shorten the canal lengthwise: the circular ones produce an opposite effect. The latter admit of distention, until the gut exceeds an inch in diameter; they contract it again to half a line, or even close the canal entirely.

The antiperistaltic action seems just sufficient in degree, in a healthy animal, to retain the chyle for the action of the absorbing vessels. In diseases, or when an insuperable obstacle exists to the natural passage of the aliment, this inverted motion is carried to a great degree, so that the contents of the small and even large intestine are conveyed into the stomach, and expelled by vomiting.

The *large intestine* is that portion of the alimentary canal, which extends from the end of the small intestine to the anus, and is so named because its diameter considerably exceeds that of the small. It is distinguished from the latter, not merely by its situation, connections, external form and functions, but also in its minute structure, so that a very small portion of it might be distinguished from a similar piece of the stomach or small intestine.

Its situation is more defined and constant than that of the small intestine. Beginning in the right iliac region, it rises in front of the right kidney, goes backwards under the liver, and then turns forwards and towards the left (the first or hepatic flexure of the colon). It continues in a transverse direction, from right to left, under the gall-bladder, the stomach, and the notch of the spleen, below and behind which it turns again, and forms a large angle (the second or splenic flexure). It descends on the left side of the abdomen, in front of the left kidney, forms in the left iliac region a large

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a large and loose fold, resembling in its form the letter S; passes over the left sacro-iliac symphysis into the pelvis, runs along the concave surface of the sacrum and os coccygis, and ends a little beyond the anterior extremity of that bone, at the anus.

We may distinguish six portions of the large intestine: 1, the *cæcal*, which is commonly named simply the *cæcum*: 2, the vermiform, ordinarily called *processus* or *appendix vermiformis* *cæci*: 3, the *right* part of the colon, or the ascending portion: 4, the *transverse* part, or the arch: 5, the left part, including the descending colon and the sigmoid or iliac flexure of the gut: 6, the *rectum*. Very commonly the tube is divided into the three parts, *cæcum*, colon, and *rectum*. These different names, as in the small intestine, have led to the employment of the phrase *large intestines* in the plural, as if there were more than one tube.

We cannot assign any exact limits to these divisions, as the position of the intestine, on which they are founded, varies in its different states of distention or emptiness. The right colon descends lower, and appears longer when it is full than when empty. The transverse portion, when filled, may descend, from the looseness of its attachment, to the umbilicus or pelvis: if it be longer than usual, it forms an arch with the concavity upwards, or it may make one or two turns. When removed from the body, all distinction of particular divisions is lost, and the gut forms a straight uninterrupted tube. It is from three to five times shorter than the small intestine, and they are to each other nearly as five to twenty-five. In individuals of good proportions it measures about seven feet. The connections of the intestine are more firm in some situations, and more loose in others. In many parts the peritoneum does not entirely surround the tube, but covers its anterior portion only, leaving the posterior part to be affixed by cellular substance to the contiguous organs. The term *mesocolon* is applied generally to the peritoneum covering the large intestine.

The *mesocolon dextrum* passes from the under and back part of the liver, from the apex of the last rib, from the right quadratus lumborum, and *iliacus internus*, in front of the right colon and *cæcum*. Thus these parts, which are only covered on their anterior surface, are firmly bound to the iliac muscle, the kidney, liver, and duodenum, and constantly held in this situation. The appendix has its peculiar small and falciform mesentery.

The transverse mesocolon is a broad and loose fold, by which the transverse part of the intestine is uniformly covered, except just at the separation of its two laminae. The left mesocolon is inflected towards the right, nearly at a right angle, and is then continued behind and below the stomach and liver, in a transverse direction to the left kidney, under the name of *mesocolon transversum*. Together with the arch of the colon, it forms a kind of transverse partition or diaphragm, loose at the anterior edge, and separating the stomach, duodenum, spleen, and liver from the other abdominal contents. It is generally horizontal, as its name denotes; but it is sometimes so broad and long as to descend with the intestine into the pelvis. It is made up of two laminae of peritoneum, including between them, besides the blood-vessels, the absorbents with their glands, and the nerves of the intestine, connected and covered by more or less fat, the duodenum, and pancreas. The latter parts are placed quite at the root of the fold.

The upper lamina descends from the splenic fold of the peritoneum, the pancreas, the upper lumbar vertebrae, the external covering of the duodenum, and the neighbourhood of the kidney and vena cava. The inferior lamina, which is more simple and strong, comes on the left from the situa-

tion under the spleen, where it surrounds the duodenum by a kind of femilunar fold; then from the right kidney, and from a fold placed between the liver and kidney.

The breadth of this mesocolon leaves the arch of the intestine quite moveable, so that its situation is by no means constant; the distended stomach pushes it downwards, and the repletion of the small intestine has the contrary effect. The great omentum covers the front of the transverse colon, and passes between this and the stomach: but does not tend at all to fix it.

The *mesocolon sinistrum* is continued over the intestine, from the iliac vessels and *psoas magnus* to the left kidney: covering only the anterior surface. The back of the intestine is connected by cellular substance to the diaphragm, the *psoas*, and the kidney, so that its situation is very fixed. Sometimes, however, there is something like a mesentery belonging to this part of the tube.

The *mesorectum* is a duplicature, varying in breadth, produced from the side of the pelvis to the sigmoid flexure of the colon, and the commencement of the rectum. It is broadest above, where it is continuous with the *mesocolon sinistrum*, and ends in an acute point below. It is made up, like the mesentery, of two laminae of peritoneum, including between them the blood-vessels, &c. of the intestine, and fat, and separating to cover the rectum. It allows the intestine a considerable liberty of motion. Below the termination of the *mesorectum*, the gut has no peritoneal coat; but is united by cellular substance to the surrounding organs: that is, to the sacrum and os coccygis, to the vagina in the female, to the bladder and prostate in the male. Its extremity is still further fixed by the attachment of the muscles of the anus, and by its continuity with the common integuments.

The diameter of the tube, when moderately distended, is about two inches or two and a half.

The ileum descends gently to the right *iliacus internus* muscle, and is inserted obliquely into the left and posterior side of the large intestine, between the *cæcum* and right colon, having its muscular and mucous coats continuous with those of the large intestine. This extremity of the small intestine forms an acute angle with the *cæcum*, and a right angle with the colon: its upper half is placed transversely, the lower ascends. On opening the large intestine, we find the communication to be of a valvular nature, and composed of two folds (*ala* or *labia*), a superior and an inferior one: it is prominent, soft, and of course moveable. Each of these folds is composed of a smaller internal lamina, which is the mucous lining of the small intestine, and an external larger one, composed by the corresponding coat of the large. These laminae, connected by cellular substance, and continuous with each other at the sides of the opening, form the *valvula coli* (*valvula ili*, or *ileo-colica*, or *ileo-cæcalis*). The superior fold, placed nearly transversely, is shorter and narrower than the inferior, which rises the highest of the two. A kind of stricture or fold of the large intestine bounds the valve on each side. Between the two folds composing this valve, the orifice of the small intestine opens transversely; its figure is an oblong oval, and its dimensions are much less than the diameter of the ileum. The length and breadth of the folds, and consequently the size of the interposed aperture, vary greatly. Sometimes the lower fold is very long and broad, the upper short and narrow, so that the intestine opens obliquely by a very small aperture. This structure admits of the opening being very completely closed. Sometimes both folds are but slightly prominent, and their distinction not clearly marked. Here the opening is more nearly circular, and cannot be so perfectly shut.

The external or peritoneal coat passes over the communica-

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tion between the two intestines, with a smooth surface, making no fold, and confining the parts in their relative situation to each other. The muscular and mucous coats, and the cellular substance of the two intestines, are continuous, and this continuity retains the folds of the valve in their situation. When the peritoneum and muscular parts are cut through, the mucous lining which forms the valve is no longer retained; the ileum may be withdrawn from the colon, the two folds being destroyed, the communication has a circular appearance, and its dimensions are equal to those of the small intestine.

The structure of this part is most advantageously observed by dissecting it under water. When the intestine is inflated and dried, the general figure and direction of the two folds, and of the aperture between them, can be clearly seen: but they are rendered rigid, smooth, and shorter than is natural, and their margins are too far separated.

As the two folds, which compose the valvula coli, represent two oblique planes, converging in such a manner as to form a convexity towards the large, and a concavity towards the small intestine, whatever presses against them in the concave surface will separate them, and open more widely the interval between them: whatever comes against them on their convex aspect will approximate them, and tend to destroy the opening. The contents of the ileum, passing in their natural course, are in the former case; and those of the colon in the latter. Hence they prevent the admission of feces into the small intestine; as we can generally prove by distending the large intestine with air or water: those fluids do not escape by the ileum. Yet this experiment does not always succeed perfectly: and probably under particular circumstances in the living body, a retrograde passage takes place: hence vomiting of feces and of matters thrown up in dysentery. We must recollect, in arguing from the result of trials with air or water, that the feces, of which the return is prevented, possess usually considerable consistence.

The large intestine is composed of three coats or layers of the same nature, and distinguished by the same names as those of the small.

The external, or serous covering, according to what we have said concerning the connections of the organs, is a partial one in some divisions of the tube. This is elevated at intervals into small processes, containing fat, and completely resembling portions of omentum. For an account of these parts, which are called appendices epiploicæ, and are peculiar to the large intestine, see EPIPLOON.

The muscular covering of the intestine is made up of two orders of fibres: those of the interior stratum are circular, and uniformly extended over the mucous membrane, as in the small intestine: they are connected to that coat by a similar copious cellular substance, described often as a nervous coat. The longitudinal fibres are collected into three bands having the appearance of ligaments, and placed at equal distances from each other on the surface of the tube. These bands are much shorter than the other coverings, which are therefore puckered up and form cells between them. The three commence at one point about the appendix vermiformis, diverge and grow broader as they ascend over the cæcum: are continued through the whole length of the colon; grow broader and stronger on the rectum, and are united into a continuous muscular sheath, including about the fix last niches of the gut. One band is on the unattached part of the intestine: another is covered on the arch by the omentum; and the third is found at the attachment of the mesocolon. The surface is level, tense, and rather depressed in the situations occupied by these bands; in their intervals the surface consists of a series of elevations, separated

by transverse folds, the cells being so placed as to cut the long axis of the gut at right angles: externally, therefore, the tube seems made up of a triple series of hemispherical elevations, internally of the same number of rows of cells. This appearance is peculiar to the large intestine: it exists no longer in the rectum, where the bands are united into an uniform stratum.

The serous and mucous coats with the circular fibres are so pliable in consequence of the arrangement just described, as to form on the inside very considerable transverse folds: these are largest at the beginning of the tube, become smaller, and are entirely lost in the rectum. The folds are of different sizes, and variously intermixed: between two of them a cell is formed of an elliptical figure, narrower at its oblong orifice, and larger about the middle. If the intestine be inflated, and the longitudinal bands cut through in several parts, the whole intestine may be extended into a much greater length, the folds and cells disappear, and the tube becomes nearly cylindrical.

The mucous coat forms various folds in the cells of the intestines when in its contracted state, similar to the folds occurring in the stomach: they disappear on distention. Its soft and pulpy surface is covered with a tenacious mucus. It differs from that of the small intestine in possessing no villi. Numerous single mucous glands are found over the whole large intestine: they lie on the outer surface of the mucous coat, which is penetrated by their ducts.

The arteries of the large intestine come from the superior and inferior mesenteric trunks; the veins join the inferior mesenteric branch of the vena portarum. The absorbents, both superficial and deep-seated, pass through glands which lie close to the intestine: these are smaller than the mesenteric glands, and fewer in number, being reckoned from 25 to 50, and are nearer to the gut. After passing through several of them, the absorbents terminate, near the kidneys, inferior mesenteric artery and pancreas, in the same glands at which the lacteal vessels of the small intestine arrive. They are, on the whole, much fewer and smaller than those of the small intestine.

The nerves come from the plexuses of the great sympathetics, and from the several branches, and are connected to the arteries. The end of the large intestine is a point at which the organic and animal lives are united; here we have very obvious animal sensibility, and the muscular actions are considerably influenced by the will. Where the small intestine joins the large, the latter is produced, below the opening of communication, into an obtusely conical process, two or three inches in length, having the same unequal surface as the rest of the tube, and terminating in a blind extremity; this is the part called the cæcum. Usually this is larger in size than the continuation of the tube, and has been therefore called caput coli. It is covered almost entirely by peritoneum, but is connected on its right side, for a small extent, to the iliacus internus, by cellular substance. It varies much in size, form, and position; sometimes it is scarcely one inch, sometimes nearly four in length. It may be larger or smaller, more or less irregular on the surface, &c.

From the posterior part of the cæcum, a small intestine, about the size of a quill, cylindrical in its figure, and terminating after one or two turns in a rounded and blind extremity, is continued obliquely towards the left. This is the appendix vermiformis. It is rather larger at its commencement than in its progress, and is held by a small fold of peritoneum, like a mesentery. Its coats contain numerous mucous glands, and its cavity, which communicates freely with that of the cæcum, is generally filled with a thickish mucous

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fluid. It seldom contains feces in the adult. Its length, size, figure, and direction vary greatly: it may be from one to six long, and from one to three lines broad. It very frequently adheres to the surrounding parts.

The rectum descends in an arched course, of which the convexity is turned downwards and backwards, from the last lumbar vertebra to the anus. Its curve is most clearly observed when the part is considered in a lateral view. In the infant, on account of the small size of the pelvis, it is continued for the greatest part in the abdomen. Its external surface is uniform. The peritoneal covering is a partial one, and belongs only to the sides and anterior part of the intestine: behind it is connected to the pelvis by cellular substance. This membrane forms two lateral folds, continued, in the male sex, to the sides of the bladder; in the female to the vagina and the posterior surface of the broad ligaments of the uterus. From the anterior part of the intestine the peritoneum passes in men to the posterior and inferior part of the bladder, and in women to the under surface of the vagina. Beyond this point the intestine is continued, still in a curved course, with the convexity downwards, for an inch or more, united by cellular substance in the male subject to the vesiculae feminales, urinary bladder and prostate, in the female to the vagina. The serous coat has appendices epiploicae.

The muscular covering consists of a thick and strong layer of longitudinal fibres, and of a strong stratum of circular ones: the latter form an oval tumid ring at the end of the gut, called the sphincter ani internus.

The cellular substance is continued, at the end of the gut, into the general subcutaneous stratum; and the mucous lining is gradually, and in the European imperceptibly, lost in the common integuments. But in the negro the boundary is more clearly marked by the cessation of the black rete mucosum.

The mucous coat is marked with longitudinal serpentine folds, and covered with a copious viscid mucus: the latter is secreted by glands, whose ducts perforate the membrane, and the largest of which are near the termination of the gut.

The extremity of the intestine is provided with certain muscles concerned in the motions performed for the expulsion of the feces: these are the levatores ani, sphincter ani, transversi perinei, and coccygei.

The *levator ani* is a thin, broad, and flat muscular plane, of an irregularly quadrilateral figure, rather curved in its inner surface, and forming a septum, which closes the pelvis below, and completes the abdominal cavity. Its origin extends from the pubes to the spine of the ischium: it commences by short aponeurotic fibres, just behind the arch of the former bone, and continues its origin from a broad and thin aponeurosis which covers the obturator internus. The anterior fleshy fibres pass obliquely downwards, backwards, and inwards, and are lost on the prostate and sides of the rectum, where they are intermingled with the sphincter. The larger portion, which is behind these, passes downwards in the same direction, is partly united to the opposite muscle, by an aponeurotic expansion, between the rectum and coccyx, and partly fixed to the side of that bone. The external surface of the levator is in contact with the obturator internus, the gluteus magnus, the transversus perinei, and lower down with a large quantity of cellular and adipous tissue. The inner surface corresponds to the prostate, bladder, and rectum. For the description of the coccygeus, see *Coccygeus*.

The *sphincter ani* surrounds the termination of the intestine just under the integuments, and is commonly divided into

the sphincter cutaneus, or externus, and the internus. The latter, as we have already mentioned, is to be regarded rather as the termination of the circular muscular fibres of the gut, than as a distinct muscle. It is a pretty thick muscular ring, about half an inch in breadth. Externally, the longitudinal muscular fibres of the rectum cover it: on the inside it covers the mucous membrane of the intestine. The superior margin is continuous with the circular fibres of the gut: the inferior is placed between the opening of the external sphincter and the membrane of the intestine.

The sphincter externus, or cutaneus, is placed more superficially than the former, and extends from the apex of the coccyx to the posterior part of the perineum. It is flattened, elliptical, with its long axis inclined from behind forwards, and perforated in the middle. We distinguish in it a superior and an inferior surface, a right and left edge, and an anterior and posterior extremity. The thin skin surrounding the anus covers the under surface: the upper corresponds to the levator ani, being at first separated from it by cellular tissue, but having its fibres completely blended with those of that muscle on the rectum. The front end forms a sharp point, extending more or less under the back edge of the accelerator urinæ, to which, as well as to the transversus perinei, it is closely connected. The posterior extremity is also pointed, and attached to the coccyx by a dense cellular matter approaching to the nature of ligament. The margins are partly covered by the skin, and partly by a mass of cellular and adipous substance.

The sphincter consists wholly of fleshy fibres, which describe concentric arcs of circles: those of the two sides are united at acute angles before and behind the anus.

The front end of the muscle is less elongated and acute in the female than in the male subject. In both its fibres are intimately blended with those of the internal sphincter.

The *transversus perinei* is situated towards the back part of the perineum, between the tuberosity and ramus of the ischium, and the middle of the space comprised between the bulb of the urethra and the anus. It is thin, flattened, and somewhat triangular. The anterior surface is inclined downwards, and corresponds to the erector penis and accelerator, and to the fat which fills the intervals between these. The posterior, inclined upwards, lies against the levator ani: cellular tissue, and the deep-seated branch of the internal pudic artery, separate them. The outer edge is attached to the inner surface of the tuberosity and ramus of the ischium, above the erector penis and the root of the crus penis. The inner edge is united to that of the opposite muscle, to the front of the sphincter ani, and to the back edge of the accelerator. The transversus is separated from the skin in front by a considerable quantity of fat: behind it is confounded with the reddish cellular tissue found in the angle between the bulb of the urethra, and the root of the corpus cavernosum. The origin is aponeurotic; and the termination is usually in a tendinous line.

The *transversus perinei alter* is not constantly found. It is a slender elongated fasciculus, running parallel to the ischium, on the inner edge of the erector penis. The origin is derived from the tuberosity of the bone, near to that of the erector; it terminates above in a thin aponeurosis connected to the bulb of the urethra, or corpus cavernosum.

Motions performed by these Muscles.—The muscular organs just described have two principal offices: 1. They move the whole pelvic viscera together. 2. They act on the rectum in particular. The levator and coccygeus are principally concerned in the former case. They represent a muscular plane capable of elevation and depression, and of moving

moving the organs which it supports in various directions. This plane is opposed in situation and action to that of the diaphragm: thus two strata, concave in opposite directions, and capable of contracting or enlarging, at the will of the animal, the perpendicular diameter of the abdomen, are placed at the opposite ends of this diameter. The most signal contraction is observed in the violent efforts employed for expelling the feces, urine, &c.: and the most marked enlargement in strong expirations, as in coughing, sneezing, &c. But these effects are produced much more by the depression of the diaphragm contracting the abdomen from above downwards, than by the elevation of the other muscles. The latter support the parts, and enable them to resist the efforts of the former: the impulse may be felt very plainly by placing the hand on the perineum during any strong exertion of the abdominal parietes. The power of resistance is much less in these parts than in the sides of the abdomen, because the bony sides of the pelvis, and the contained viscera, support great part of the effort.

The action of the sphincter ani has the effect of contracting the opening of the rectum: it is constantly exerted for the purpose of maintaining the aperture permanently closed. Other openings furnished with sphincters, such as those of the mouth and eyelids, are often open for a considerable time, because there are various muscles which antagonise the sphincters; no such muscles exist about the anus. The only antagonist power is in the longitudinal fibres of the rectum, and in the contraction of the abdominal parietes; and these are only exerted when the feces are evacuated. An obvious advantage arises from the permanent constriction of the rectum, in preventing the escape of its contents: they are retained in the large intestine until their quantity produces irritation. When the sphincter is paralysed, they escape involuntarily as they arrive in the rectum. This permanent action of the sphincter resembles that of parts belonging to the organic life, as it is completely independent of the will: yet we have the power, by means of volition, of constringing the opening more completely. The feces are evacuated in opposition to the resistance of the sphincter, which is overcome by an exertion of the abdominal parietes. The harder they are, the greater dilatation is required, and the greater difficulty is consequently experienced; and *vice versa*. When they are very fluid, they may escape in a slight degree by the longitudinal plaits into which their contraction collects the skin of the anus.

The action of the longitudinal fibres of the rectum, and the pressure of the abdominal viscera, urged downwards by the respiratory muscles, occasion the intestine to descend slightly when the feces are voided. The levatores ani, coccygei, and transversi perinei, support the parts under this effort, limit the descent, and then restore them to their former situation. The levatores probably may be concerned in the functions of the generative organs by compressing the vesiculæ seminales and prostate; and the transversi, by fixing the posterior end of the accelerator, may concur with that muscle in the expulsion of the semen.

The large intestine of the fœtus is rounder and smaller than in the adult, hardly marked by any cells in young embryos, and not exceeding the small in diameter. The cæcum is gradually diminished into the appendix vermiformis, which is considerably larger than in the adult, and disposed by its mesentery into a special arrangement. It is much more considerable in size compared to the cæcum. This is the appearance of the part at birth, when it usually contains fecal matter. Soon after, the distinction between the cæcum and appendix is more strongly marked: the

latter, instead of coming from the middle of the former, is produced from its left side; and as it is not increased while the cæcum is growing in size, the proportions of the adult are gradually established.

After what we have observed concerning the action of the small intestine, the reader will immediately perceive how the muscular fibres of the large must act.

INTESTINES, *Inflammation of*. See ENTERITIS.

INTESTINES, *Protrusions of*. See HERNIA.

INTESTINES, *Wounds of*. See WOUNDS.

INTESTINES of Birds. See ANATOMY OF BIRDS.

INTESTINES of Fish. See FISH.

INTIRE TENANCY. See TENANCY.

INTONARE, to touch in the cathedral service a single key on the organ, to pitch for the priest, the choir, and the congregation, the responses.

INTONATION, in canto fermo, implies an ecclesiastical tone or mode.

INTONAZIONE, *Ital.* intonation, a sound or tone. A vocal performer who sings in tune, is said to have a good intonation, the first of all vocal virtues. Singing out of tune, false intonations, the Italians call *intonazioni perfide*.

INTOUR, in *Geography*, a town of Hindoostan, in the circar of Cuddapa; 35 miles N.W. of Gandicotta.

INTOXICATION. See DRUNKENNESS.

INTRADA, INTRATA, or *Entrata, Ital.* an entry, introduction, prelude. In the 17th century, an overture in France was termed *entrée*.

INTRANSITIVE VERBS, in *Grammar*, such whose action does not (*transire*) pass on an object, or subject. See VERB *Neuter*.

INTRENCHMENT, in the *Art of War*, all sorts of works made to fortify a post against an enemy. See RETRENCHMENT.

They usually consist only of a bank of earth and a ditch, and are of two sorts; such as the trenches carried on in a siege, where the bank is between the ditch and the enemy or town; and where the earth is thrown up against the town; and such as serve to inclose a town or camp, secure a pass, cover the entrance into a country or other places, &c. In these the ditch is between the bank and the enemy. The first fort are usually called *trenches* or *approaches*; and the second are generally called *lines*.

It was a maxim amongst the Romans, that even in their most hasty marches they intrenched every night.

INTRESSIN, in *Geography*, a town of the duchy of Warsaw; 40 miles S. of Posen.

INTRIGUE, or INTREAGUE, an assemblage of events, or circumstances occurring in an affair, and perplexing the persons concerned in it.

The word is French, *intrigue*, formed from the Latin *intricare*; which, according to Nonius, comes from *trica*, *entanglements*; and that from the Greek *τρίψω*, *hairs*: *quod pullos gallinaceos involvant et impediunt capilli*. Which conjecture is adopted by Tripaud, who will have the word *intrigue* to be primarily and properly understood of chickens, which have the feet entangled in hair; and to be derived from the Greek *ει*, and *σπῆ*, *hair*.

INTRIGUE is more particularly used to signify the plot of a play, or romance; or that point wherein the principal characters are the most embarrassed, through the artifice and opposition of certain persons, or the unfortunate falling out of certain accidents and circumstances.

In a tragedy, comedy, or epic poem, there are always two designs; the first and principal is that of the hero of the piece; the second contains the designs of all those who oppose him. These opposite causes produce opposite effects,

to wit, the efforts of the hero for the execution of his design, and the efforts of those who thwart it. As those causes and designs are the beginning of the action, so those efforts are in the middle, and there form a knot or difficulty, which we call an intrigue, that makes the greatest part of the poem. It lasts as long as the mind of the reader or hearer is suspended about the event of those opposite efforts: the solution or catastrophe commences when the knot begins to unravel, and the difficulties and doubts begin to clear up.

The intrigue or plot of the *Iliad* is two-fold; the first comprehends the three days fighting in Achilles's absence, and consists, on the one side, in the resistance of Agamemnon and the Greeks, and on the other, in the inexorable temper of Achilles. The death of Patroclus unravels this intrigue, and makes the beginning of a second. Achilles resolves to be revenged, but Hector opposes his design; and this forms the second intrigue, which is the last day's battle. See *ILIAD*.

In the *Æneid* there are also two intrigues: the first is taken up in the voyage and landing of Æneas in Italy; the second in his establishment there. The opposition he met with from Juno, in both those undertakings, forms the intrigue. See *ÆNEID*.

As to the choice of the intrigue and the manner of unravelling it, it is certain they ought both to spring naturally from the ground and subject of the poem. Boissu gives us three manners of forming the intrigue of a poem; the first is that already mentioned; the second is taken from the fable, and design of the poet; in the third, the intrigue is so laid, as that the solution follows from it of course.

INTRIGUE, in common language, is used to denote a plot; a private transaction in which several parties are engaged, and usually an affair of love. Johnson.

INTRINSIC, a term applied to the inner, real, and genuine values, properties, &c. of any thing; in opposition to their extrinsic, apparent, or popular values, &c. See *EXTRINSIC*.

INTROBIO, in *Geography*, a town of Italy, in the department of the Montagna; 7 miles N. of Lecco.

INTRODUCTION, in *Rhetoric*, is the first part of an oration or discourse, designed to prepare the minds of the hearers for the suitable reception of the succeeding parts: and for this purpose it is necessary that the orator gain the good opinion of his hearers, secure their attention, and give them some general notion of his subject. In order to gain the good opinion of his hearers, the orator, when he introduces the discourse with his own person, will be careful to do it with modesty, and seem rather to extenuate his virtues and abilities, than to magnify them: when he sets out with the persons of those to whom the discourse is addressed, it is not unusual to commend them for their virtues, and those especially which have a more immediate relation to the present subject. The other topics which are to be insisted upon for gaining esteem, are principally taken from the subject, as its justice, importance, advantage, or pleasure. In speaking of gaining the attention of the hearers, Cicero says, we shall be heard attentively by one of these three things; if we propose what is great, necessary, or for the interest of those to whom the discourse is addressed. Some account of the subject should always make a part of the introduction. As to the composition of this part of a discourse, it should appear easy and natural, and connected with the rest of the discourse: it should be suited to its length: the language of it should be just, easy, and pleasant: it ought neither to be wholly without passions, nor too violent and impetuous. It ought not to be too general. The introduction, however, is

not an essential part of a discourse, and is sometimes omitted by the best orators. Ward's *Or.* vol. i. lect. 12.

INTRODUCTOR, in *Antiquity*, was particularly used for an officer, who introduced the athlete to the stadium, or place where they were to contend.

INTROITUS, in the *Roman Ritual*, as settled by St. Gregory, is an introduction to high mass on great festivals, preceding the usual psalms.

INTROMISSION, in *Natural History*, is a term relating to the petrification of organic substances, in which mineral substitution takes place, during the removal of the organic particles, (the mineral being gradually introduced into the animal or vegetable body,) supplying the place, and taking the form of the matter lost. By this mode of petrification the internal fabric, as well as the external figure of the original is preserved. Petrified wood has usually partaken of this kind of change. See W. Martin's *Outlines*, p. 55. Petrifications formed by intromission, are sometimes said to be ingenerate. *Outl.* p. 67.

INTRONATI, the name of an academy at Sienna, in Italy.

The members of this academy contented themselves, at their first institution, with establishing the following six short laws: 1. To pray. 2. To study. 3. To be merry. 4. To offend nobody. 5. Not to credit too lightly. 6. To let the world talk.

INTROSUSCEPTION, in *Surgery*. See *INTUSSUSCEPTION*.

INTRUSION, in the *Canon Law*, signifies the enjoyment of a benefice, or exercise of an office, without a good title to it.

The word is derived from *intrudere*, to thrust in, or enter by force.

Intrusion disqualifies the party from ever holding the benefice.

INTRUSION, *Information of*, in *Law*, is a method of suit, by information on behalf of the crown, filed in the exchequer by the king's attorney-general, for any trespass committed on the lands of the crown, as by entering thereon without title, holding over after a lease is determined, taking the profits, cutting down timber, or the like. See *INFORMATION*.

INTRUSION also denotes the entry of a stranger, after a particular estate of freehold is determined, before him in remainder or reversion. This entry and interposition of the stranger differ from an abatement in this; that an abatement is always to the prejudice of the heir, or immediate devisee; an intrusion is always to the prejudice of him in remainder or reversion. An intrusion is always immediately consequent upon the determination of a particular estate; an abatement is always consequent upon the descent or devise of an estate in fee-simple. And in either case the injury is equally great to him whose possession is defeated by this unlawful occupancy. See *OUSTER*.

INTRUSIONE, a writ brought against an intruder, by him that hath fee-simple, &c. See *Writ of ENTRY*.

INTUITION, among *Logicians*, the act whereby the mind perceives the agreement or disagreement of two ideas, immediately by themselves, without the intervention of any other: in which case the mind perceives the truth, as the eye doth the light, only by being directed toward it. Thus the mind perceives that white is not black, that three are more than two, and equal to one and two. See *IDEA*.

This part of knowledge, says Mr. Locke, is irresistible, and, like the sunshine, forces itself immediately to be perceived, as soon as the mind turns its view that way. It is on this intuition that all the certainty and evidence of our other

other knowledge depends: this certainty every one finds to be so great, that he cannot imagine, and therefore cannot require, a greater. See JUDGMENT, KNOWLEDGE, DEMONSTRATION, &c.

INTUITIVE EVIDENCE, is that which results from intuition. Dr. Campbell distinguishes different sorts of intuitive evidence: one resulting purely from intellect, or that faculty which others have called intuition; another kind arising from consciousness; and a third sort from that new-named faculty *common sense*, which this ingenious writer, as well as several others, contend to be a distinct original source of knowledge; whilst others refer its supposed office to the intuitive power of the understanding. Campbell's Rhetoric, vol. i. book i. chap. 5.

INTURKI, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 18 miles N of Wilna.

IN TURN, among *Wrestlers*, is when one puts his thigh between those of his adversary, and lifts up his thigh.

INTUSSUSCEPTION, or INTROSUSCEPTION, a term in *Surgery*, expressive of a very dangerous disease, which arises from the passage of one portion of an intestine into another. The word is derived from *intus*, within, and *suscipio*, to receive. The disorder is also frequently named a *volvulus*. It happens most commonly in the first fifteen years of life, older persons not being nearly so subject to the affliction.

When the upper part of an intestine passed into the lower, that is to say, when the intussusception was downwards (as generally happens), Mr. Hunter called the case *progressive*; but when the disease arose from the passage of a lower portion of bowel into an upper one, he named this example *retrograde*.

Intussusceptions are probably far more frequent cases than many suppose, and numerous infants and young subjects, no doubt, are victims to the disease, without its existence being in the least suspected. The affection may indeed be less severe; and we are informed, that the greatest part of three hundred children who died, either of worms, or during dentition, at the Hôpital de la Salpêtrière, and were examined by M. Louis, had two, three, four, and even more volvuli, without any inflammation of the parts, or any circumstances leading to a suspicion that these affections had been injurious during life. M. Louis thought such cases proved that an intussusception might be formed, and destroyed again, by the mere action of the bowels; an opinion which is confirmed by the observation of Dr. Baillie, that "in opening bodies, particularly of infants, an intus-fusceptio is not unfrequently found, which had been attended with no mischief; the parts appear perfectly free from inflammation; and they would probably have been easily disentangled from each other by their natural peristaltic motion." See Mem. de l'Acad. de Chirurgie, 4to. edit. tom. iv. p. 222, and Baillie's Morbid Anatomy, 2d edit. p. 162.

Mr. Hunter thought that the manner in which an intussusception may be formed, is, by one portion of a loose intestine being contracted, and the part immediately below relaxed and dilated; under which circumstances the contracted portion slips a little way into that which is dilated. He supposed also, that this change was not the effect of any action in either portion of intestine, but might be the consequence of some additional weight in the upper part of the bowel. How far the peristaltic motion, by pushing the contents on to the contracted parts, might force these into the relaxed ones, Mr. Hunter was unable to determine, though he was inclined to think that nothing of the kind could happen.

Supposing the foregoing explanation to be true, an acci-

dental intussusception may take place either upwards or downwards; but if a continuance or an increase of the disease really arises from the action of the intestine, it can only be when the case is downwards. Yet this does not explain those instances in which a considerable portion of intestine is carried into the gut below. In order to understand these, the different parts which form the intussusception must be considered. We must recollect that every intussusception is composed of three folds of intestine; viz. the *inner*, which passes down, and being reflected upwards, forms the *second*, or *inverted* portion, which, being reflected down again, makes the *third*, or *containing* part. This latter is the outermost, and is always in its natural position.

According to Mr. Hunter, the outward fold is the only one which is active, the inverted portion being perfectly passive, and squeezed down by the outer, which inverts more of itself, so that the angle of inversion, in the case, is always at the angle of reflection of the outer into the middle, or inverted fold, while the innermost is drawn in. Hence we may see how an intussusception, once begun, may have any length of gut drawn into it.

The external portion acting upon the other folds in the same way as upon any extraneous matter, will, by its peristaltic motion, urge them further; and if any extraneous substance is detained in the cavity of the inner portion, that part will become a fixed point for the outer, or containing intestine to act upon. Thus it will be squeezed on, till at last the mesentery, preventing more of the innermost part from being drawn in, will act as a kind of stay; yet, without entirely hindering the inverted outer fold from going still further. For since it is the middle fold which is acted upon by the outer, and this action continues after the inner portion becomes fixed, the gut is thrown into folds upon itself; so that a foot of intestine may not form an intussusception more than three inches long.

The outer portion of intestine is alone active in increasing the disease when once begun; but if the inner one were capable of equal action in its natural direction, the effect would be the same, viz. that of endeavouring to invert itself, as, indeed, happens in a prolapsus ani. The outer and inner portions would then tend to draw in more of the gut, while the intermediate part only would, by its action, have a contrary tendency.

Although capable of producing a prolapsus ani, the action of the abdominal muscles cannot assist, either in forming or continuing this disease, since the effect of it must be to make equal compression both above and below.

The manner in which the intestines are connected with the mesentery, would lead one to consider it impossible for any portion of the bowels to pass far within another, particularly as the increasing quantity of mesentery, that is drawn into the intussuscepted part, must render the further passage of intestine more and more difficult. The large intestines, being also more closely confined in their natural situations, would seem to be far less liable to the disease. One of the largest intussusceptions ever known, however, was in the colon, as related by Mr. Whately in the Phil. Transf. vol. lxxvi. p. 305. The intussusception appeared to have begun at the insertion of the ileum into the colon, and to have carried in the cæcum with its appendix. The ileum passed on into the colon, till the whole of the ascending colon, the transverse arch, and descending colon, were carried into the sigmoid flexure and rectum. The valve of the colon being the leading part, it at last got as low as the anus; and when the person went to stool, he only emptied the ileum, for one-half of the large intestines being filled up by the other, the ileum alone, which passed through the centre, discharged its contents.

tents. The disease, when it thus begins at the termination of the small intestines in the large, is particularly apt to proceed to a considerable extent, and mostly proves fatal. Many instances of this kind are upon record. In the Edinburgh Medical and Surgical Journal, vol. iii. p. 263, Mr. Langstaff has published an interesting example. The case is that of a child three months old, where, upon examination after death, there was an extensive intussusception in the usual direction, together with a smaller one of the retrograde description, similar to what occurred in the instance related by Mr. Spry in the Med. and Physical Journal, No. 11.

Retrograde intussusceptions are much less common than such as are named progressive. In the Medical and Chirurgical Transactions, vol. i. Mr. Home has inserted the account of a retrograde intussusception, which happened in a cabin boy, who had previously swallowed arsenic. The case was also rendered remarkable by a small worm, which was found coiled up round the intussuscepted portion of the intestines.

A prolapsus ani is, in some respects, similar to an intussusception, and may possibly begin in the same way; but it is always continued by the action of the abdominal muscles, and never by that of the bowel itself. It differs from an intussusception in not being included in an intestine; for instead of having a containing bowel, inverting itself by its own action, there is an inclosed intestine protruded by the action of the abdominal muscles, while the passage of the feces through it, and the point of inversion, are at the extremity of the protrusion; and as it becomes inverted, it projects out of the body. Med. and Chir. Transf. vol. i. p. 112.

With regard to the symptoms of intussusception, they very much resemble those attendant on inflammation of the intestines, hernia, and any obstruction in the alimentary canal. In several of the cases upon record, the seat of the disease was plainly indicated by a hard tumour upon the left side of the abdomen. Sometimes it has been found impossible to inject more than a trivial quantity of fluid as a clyster; a circumstance which would strengthen the suspicion of what the disorder really is. If, also, (observes Mr. Langstaff,) the invaginated portion descended so low as to form a protrusion at the anus, and we could ascertain, that it was not an inversion of the rectum itself, the case might be considered as clear, and we should have no hesitation in delivering a prognosis, which, by preparing the friends for the fatal termination, would exonerate us from all blame on its occurrence.

Intussusception, like most other diseases, which are furthest from the reach of medical and surgical assistance, has been treated in a great number of different ways.

Former practitioners very commonly exhibited for its relief, a large quantity of crude mercury; a plan which certainly could never have accomplished the desirable object of disentangling the affected part of the bowels.

It has even been proposed to perform gastrotomy, and M. Hevin, in his "*Recherches Historiques sur la Gastrotomie dans le Cas du Volvulus*," has examined, with much ability, the question concerning the prudence and propriety of such a proceeding. After many interesting observations, he expresses his decided condemnation of the proposal. The operation, indeed, is rendered quite unwarrantable by the great uncertainty and obscurity which almost constantly prevail in regard to the actual nature of the case; but even were the existence of the disease positively known, the project would not be allowable. In the first place, cutting into the abdomen, with a view of disentangling a portion of the bowels, would be of itself a source of the most dangerous and pro-

bably fatal consequences. And in the second place, the scheme of disentangling the bowels would generally be altogether impracticable, by reason of the different folds of the intestine having become inseparably agglutinated to each other. This connection, in fact, is so strong, that the contained parts can hardly be withdrawn after death. In other instances, the stricture on the intussuscepted part causes it to inflame and even mortify, in either of which states gastrotomy would be quite inadmissible.

The forcible injection of clysters was tried by Dr. Monro, without any beneficial effect.

Others have suggested the introduction of long bougies and pieces of whalebone within the anus, for the purpose of mechanically pushing back the intussuscepted portion of the bowels. But after it is known that adhesions are formed in the manner already described, what success can be expected from any plans of this kind? And what instrument could be invented, which would follow the windings of the bowels, a considerable way, without piercing their coats, and doing the most fatal mischief?

The manner in which the parts are agglutinated, explains why none of the methods hitherto devised for the relief of an intussusception, can be of any material service. Were a case to be submitted to some kind of treatment, before adhesions had taken place, perhaps the forcible injection of glysters, and the exhibition of vomits to invert the peristaltic action of the containing bowel, as proposed by Mr. Hunter, would be as rational steps as any which could be pursued.

We must reluctantly acknowledge, however, with Mr. Langstaff, that, in general, all the modes of treatment, hitherto proposed, will be found utterly inefficient. "Yet here, as in many other instances, the resources of nature are exhibited in a most wonderful and astonishing manner, while those of art completely fail. The invaginated portion of intestine sometimes sloughs, and is discharged *per anum*, while the agglutination of the parts preserves the continuity of the intestinal canal. The annals of medicine furnish numerous instances, where long pieces of gut have been discharged in this manner, and the patient has quite recovered. At the same time that we recognize the inefficacy of art, these cases will teach us to repose a just confidence in the powers of nature, and to retain some hope of a favourable event, under the most unpromising circumstances." Langstaff in Edin. Med. and Surgical Journal, vol. iii. p. 267, 268.

This gentleman has greatly enriched his paper by numerous references which will be deemed exceedingly valuable by any person desirous of being more particularly acquainted with the preceding subject.

INVADIATUS, in our *Old Writers*, a person accused of any crime, which not being fully proved, he was put *sub debita fidejussione*, and called *invadatus*.

INVALID, a person wounded, maimed, or disabled for action by age.

At Chelsea and Greenwich are magnificent hospitals, or rather colleges, built for the reception and accommodation of invalids, or soldiers and seamen worn out in the service. See HOSPITAL.

We have also several independent companies of invalids, dispersed in the several forts and garrisons.

Of these the 41st regiment was composed in 1719, but it has since been put upon the same footing with the other regiments of the line. In 1782 there were likewise 36 independent companies, forming the garrisons of Jersey, Guernsey, Scilly, Portsmouth, Plymouth, Chester, Hull, and other forts and castles; and there were also ten independent companies of invalids in Ireland. Invalids have been known in this kingdom ever since the restoration of Charles II. The invalids

invalids are armed like other regiments of infantry; their uniform red, faced with blue, and plain button holes.

At Paris is a college of the same kind, called *les invalides*, which is accounted one of the finest buildings in that city.

INVASION, in *War*, the entrance or attack of an enemy in the dominions of another sovereign.

INVECTED, in *Heraldry*, denotes a thing fluted, or furrowed.

Invected is just the reverse of *engrailed*, in which the points are turned outward to the field: whereas in invected they are turned inward to the ordinary.

INVECTIVE, in *Rhetoric*, differs from reproof, as the latter proceeds from a friend, and is intended for the good of the person reproofed; whereas invective is the work of an enemy, and entirely designed to vex and give uneasiness to the persons against whom it is directed.

INVENTION denotes the act of finding any thing new; or even the thing thus found.

Thus we say, the invention of gunpowder, of printing, &c. The alcove is a modern invention owing to the Moors.

The Doric, Ionic, and Corinthian orders are of Greek invention; the Tuscan and Composite of Latin invention.

Janfon ab Almeloveen has written an Onomasticon of inventions, wherein are shewn, in an alphabetical order, the names of the inventors, and the time, place, &c. where they are made. Pancirollus has a treatise of old inventions that are lost, and new ones that have been made; Polydore Virgil has also published eight books of the inventors of things. (*De Inventoribus Rerum*.) Beckman has also published a "History of Inventions and Discoveries."

INVENTION is also used for the discovery of any thing hidden.

The Romish church celebrates a feast on the fourth of May, under the title of "Invention of the Holy Cross."

INVENTION is also used for subtilty of mind, or somewhat peculiar to a man's genius, which leads him to a discovery of things new.

In which sense we say a man of invention: Wolfius has made some essays towards an art of invention.

INVENTION, in the *Arts of Design*, is that peculiar quality, which, being of all others the most rare, is also the most estimable in an artist. Without it the painter or sculptor rises not above the ordinary labouring mechanic, nor are his productions so useful to mankind.

Whether the power of invention be an immediate gift of God, or the offspring of cultivation, has been questioned by philosophers; and while some have traced its origin, or fancied they could, to a continued series of acquisitions, begun at an early age, and carefully stored in the mind, others have regarded it as not attainable by any exertions of man, and no other than a direct impulse imparted by the omnipotent Creator to his more favoured children.

Whichever of these abstruse opinions be correct, one thing none will be inclined to dispute, *viz.* that, be the power of imagination, which is the basis of invention, as vivid as possible in the mind of an artist, it must have materials to work upon; and if the power of combining ideas be originally given, they must first be collected: that power can never operate if the possessor does not lay by a store of observations upon the nature of things as they pass before his eyes. Invention is not creation, except as far as relates to the senses and perceptions of man. To him new combinations effectively create new objects; but in fact, it is only the power of combining, in new and previously unknown forms, things known individually before.

It grasps within its range whatever is possible, probable, or already certain; and the artist is at liberty to apply and combine whatever appertains to either of these qualities in any manner, which, producing novelty, still bears the appearance of truth, and does not wound the common perception of propriety; that is, the propriety which belongs to the nature of the subject treated of.

The exercise of invention will be more or less productive accordingly as the native vigour of fancy or imagination be accompanied by a constant and lively observation of nature, and a strong remembrance of her various productions under all the different circumstances in which they are found. A vivid imagination, being thus stored with images, requires but the slightest hint to call forth the most brilliant effects, and by contrast or combination produce new images. Sir Joshua Reynolds, in his 6th discourse, has observed, that "there can be no doubt, but that he who has the most materials has the greatest means of invention; and if he has not the power of using them, it must proceed from a feebleness of intellect, or from the confused manner in which they have been laid up in his mind;" and again, "it is vain for painters or poets to endeavour to invent without materials on which the mind may work, and from which inventions must originate. Nothing can come of nothing."

In the same lecture he remarks, that "the mind or genius has been compared to a spark of fire, which is smothered by a heap of fuel, and prevented from blazing into a flame. This simile, which is made use of by the younger Pliny, may be easily mistaken for argument or proof; but there is no danger of the mind's being over-burthened with knowledge, or the genius extinguished, by any addition of images. On the contrary, these acquisitions may as well, perhaps better, be compared, if comparisons signified any thing in reasoning, to the supply of living embers, which will contribute to strengthen the spark, that, without the association of more fuel, would have died. The truth is, he whose feebleness is such as to make other men's thoughts an incumbrance to him, can have no very great strength of mind or genius of his own to be destroyed."

These excellent remarks are made by Sir Joshua when treating of imitation; of the assistance an artist may acquire in his progress by studying the productions of other men; and to prove, that no source of information, either in nature or art, should be neglected by him who covets the title of a great inventor, or, as it is usually called, an original genius. He will find it requisite to be a constant observer of nature in all her steps, whether of the grand, the beautiful, the dreadful, expressive and interesting, or commonplace; the varieties of character among men, their modes of action, the powers of their passions, and the various ways in which they exhibit the impulse derived from them. In short, no object whatever should escape his eye without notice; no moral sentiment or feeling; his mind; and he will thus be best qualified to embody and illustrate whatever subject he may be called upon to represent.

This doctrine holds equally true of poetry, and indeed of all pursuits by which men are led, in which their necessities or their pleasures call for the exertion of their talents. But each art or science, having its peculiar end to answer, requires the observance of peculiar objects. In painting, invention requires the mind of the artist to be occupied in calling forth recollections of those circumstances he may have seen in nature, or in works of art, of a character consonant with that of the subject undertaken to be represented, and endeavouring to inspire every part of the composition with an unison of effect. If, for instance, the subject be pathetic, the painter will

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will recal to his memory those scenes and varied actions and combinations of heads and figures, and that distribution and degree of light and shade which he may have observed in nature to be most affecting; and, placing them in situations proper for his purpose, he will endeavour to carry their effect to the highest point of perfection. His principal difficulty will be, as far as relates to the invention, to clear his work of whatever is not necessary to display its character effectively; to seize upon the most just and powerfully descriptive moment in the occurrence, and, collecting together only what justly belongs to it, impart to those materials he selects the utmost degree of interest possible within the boundary of his art.

He who tells his story in the most natural, and at the same time, dignified method; who brings forth images at once intelligent and correct; and, combining them in an agreeable manner, impresses the mind of an observer with the full scope of his intention, without evidently exhibiting the art he has employed, is certainly entitled to the praise of the greatest inventor: not he, who, to be striking and imposing, composes attitudes for passions, instead of allowing feeling and nature to govern him; and fancies, when he has surprised by strong contrast or brilliant colouring, that he has effected the purposes of art.

Sometimes, indeed, the painter is called upon, like the poet, to tread in fairy ground, and illustrate his subject by images of beings found only in the regions of imagination; but he is not at liberty to indulge his fancy so freely as the poet. Forms described do not make so strong impressions on the sense as those presented to the eye by lines and colours; and many a high-flown indulgence of the inventive faculty which passes current, nay, is even allowable in poetry, would dwindle into pure grotesque if laid upon canvas, or wrought in sculpture; and would more, disgust and disappoint, than gratify a sensible mind. Such is Milton's description of Death. The obscurity of the language in which this description of the all-subduing son and paramour of Sin is enveloped, alone renders it effective in the poem. In painting, it is idle waste of time to attempt it.

—————"The other shape,
If shape it might be called that shape had none
Distinguishable in member, joint or limb,
Or substance might be called, that shadow seemed,
For each seemed either,"

is language sublimely effective of the intention of the poet, and conveys in its no meaning (when strictly examined) an indistinct and vague idea of the nature of the monster, just as the description itself is contradictory and indistinct. Still the mind of the reader is filled with figure and idea sufficient for the poet's purpose, and the degree of interest excited by the appalling tremendous circumstances of the moment and in succession, draws off his attention from dwelling long enough to discover the illusion. But once embody the idea it is made to convey in a picture, where every image remains for examination, and meets the eye, not vaguely, for then it would be no image, but apart and distinct, and it becomes absurd; the shadow, substantial, or sublimity is overpowered by obscurity.

The inventor is at liberty to combine all that is possible or probable with all that is real; or dwell in possibilities or probabilities alone. There is a limit, however, to his exertions, which is, that whatever be the nature of his subject, it should have such a degree of unison with our ideas of existence, convey such an air of real semblance, or be so compounded in its parts, as not to shock us with an apparent violation of the laws of nature, or the appearance of total

impossibility. Mr. Opie, in his Discourse on Invention delivered in the Royal Academy, says upon the same point, "that in the exercise of invention in the imitative arts, all possible licence may be granted, and any degree of the extraordinary be indulged, which does not incur the censure of being extravagant: provided that the trains of ideas be perfectly connected, and the whole consistent with itself: that there be nothing suffered to intermix which checks the progress of the imagination, exposes the contrivance or illusious, and recalls a different set of principles to the mind." To the verge of this limit the artist may indulge his fancy, and exert his powers. When he goes beyond it, and launches forth into a world of mere fanciful imagery, he may flatter himself that he is working wonders, but in fact he will be regarded as a dealer in legerdmain, as one falsifying his intellectual powers; and will only excite ridicule and mere surprise, instead of that admiration which men of sound sense can alone enjoy. The true inventor will seek only for the most natural and direct means of disclosing his ideas, of imparting that information he wishes to convey, he it of what nature it may. Thus Hogarth ranks with the very first among the possessors of this almost god-like quality; notwithstanding his subjects were of a low and frequently vulgar cast. How admirably simple, and yet how completely effective, is his figure of a Woman setting fire to the Map of the World in the Dagnio Scene in the Rake's Progress! He evidently meant to convey the idea of the mischievous power of female beauty when the possessor of it is fordid, selfish, treacherous, and base! Can words convey it more explicitly? It would be almost needless, and certainly needless, to point out the numerous instances with which his works abound of the same effective simplicity and truth of imagery, which render them so admirably attractive and useful. Sir Joshua Reynolds, in his picture of the death of cardinal Beaufort, has been equally successful. Shakspeare informs us that he died in the utmost agonies of conscience without any trust in God, any hope of salvation; the tortures of his mind convulsing him more than the agonies of body. The painter would only represent a man writhing with violent pain; and therefore, to give another character and sentiment to the representation, having effected the appearance of suffering, he introduced the fiend, "grinning horribly a ghastly smile," which at once informs the observers of the agency under which the dying man is tortured. Without this figure, which has been so loudly reprobated by many who probably regarded beauty rather than sentiment, the work would have been merely a representation of a sick man dying in pain, and an assemblage of beautiful colour. The fiend decidedly stamps its character with his own; and perhaps by a similar figure alone, can we be informed of the nature of the torments the cardinal endured, without resorting to the original Gothic mode, of introducing a label from the mouth or over the head of the figure.

In every branch of the art invention is demanded, and without it, tameness and insipidity will be the result of the artist's labours. In drawing, in colouring, and in chiaroscuro, selection, or that ideal beauty of form, force and effect on which all lovers of the arts alone delight to dwell, is entirely an effort of invention. To it we owe the beautiful and sublime forms of the statues of the heathen gods, and the grand style of design of which Michael Angelo and Lionardo da Vinci are the parents: the rich, deep, and harmonious style of colouring of Titian, Giorgione, and Rubens; the magic sweetness of effect, or chiaroscuro, in Correggio, and the force and brilliancy of it in Rembrandt. To Raphael, however, it is that the art is indebted for the noblest use of invention. His object always appears to have been the illustration

illustration of his subject, not the exhibition of his art. Of this none ever appear to have been so capable, none saw so fully the whole force of it, entered so immediately into the very heart, and throwing all trifling or indifferent occurrences aside, applied his force to strengthen what was so useful, or feeling what was wanting, was fertile in expedients to supply its deficiency. We have mentioned one instance under the article *ENERGY*, in *Painting*, which exhibits strongly the native vigour of the mind of Raphael, viz. the Cartoon of Ananias struck dead: wherein we have shewn his invention not only to have been capable of delineating the fact, but also of informing us in some measure of the preceding and subsequent circumstances connected with it. The same power may be pointed out in others of his works, particularly in the cartoon of the sacrifice to St. Paul and Barnabas at Lystra. The great perfection of the inventive faculty in the mind of this extraordinary man is exhibited in the purity, simplicity, and truth of the images he selects. It is very seldom indeed that his ideas require explanation, he never appears to have wandered from the subject of his work in search of something abstruse or rare, but trusts to the growth of ideas which appear naturally to have sprung up in his mind upon consideration of the nature and object of it. Yet so well stored was he with nature and art, that he is rarely insipid or deficient of illustration, either as relates to beauty, elegance, and grace of composition, or expression and sentiment.

Invention in the works of Michael Angelo Buonarroti is exhibited in a very different mode. Instead of treading in the beaten path of common life, or adopting the labours of others, he, breathing the spirit of the epic poet, invents his subject; and clothes it with the ideal grandeur which breadth of form, flowing lines, and bold and difficult actions can give it. Taking his own conception of the generic character of the human body for his model, he perfected, if not invented, a style of design entirely new, of a sublime and dignified nature, though bordering upon the extravagant, and rendered truly so by most of his imitators. Of this style Lionardo da Vinci is perhaps properly the parent, but he had not the full force of M. Angelo, and his invention in art was engaged in a middle way between those of the two great men we have mentioned.

In Titian we find the same faculty operating in a manner totally different. To him it was most grateful to seek after and develop the power of colours in brilliancy, depth, and clearness: and maintaining their full powers, to unite them by arrangement or contrast, in a manner harmonious and agreeable to the eye. Add to this application of his invention, a very extraordinary degree of perception of grandeur and dignity in design and effect, and he will be found to have extended the boundaries of art in no inferior degree.

To this talent in Correggio and Parmegiano we are indebted for whatever is grateful, soft, and amiable in the art of painting; and to Rembrandt for bold vivid effects of the chiaroscuro: whilst Rubens, endowed by providence with almost super-human powers, revelled in the utmost luxury of imagination, and produced works representative of almost all the varied objects of creation, with a gaiety of action and a splendour of colouring and effect unknown, in so extensive a combination, to any artist before or after him.

It is only by a constant study of the works of nature and of art that a mind possessed with the power of invention can ever be enabled to exert itself either extensively or usefully. The impressions made upon it by the common intercourse of life, without a precise direction of study, would be soon exhausted; and one poorly gifted by nature with the fire of imagination, but anxiously and steadily pursuing the studies

recommended, would soon surpass the former, be he never so richly endowed if he neglected the necessary cultivation.

INVENTION, in *Music*. Having no objects, melody, or harmony in nature to copy, except the common chord arising from the divisions of a string or sounding body into its harmonies, a musician has more to invent than the professor of any other art. Every passage, every combination, every motive or subject, that has not been used before, is invention. There is so little invention in some compositions, that whoever has heard or seen much music, could point out the prototype of every bar. There is, on the contrary, such an ambition in some authors of being new, that the ear is teased and disappointed by the constant struggle and labour to be unnatural. Haydn's invention, which is so unbounded, is never pushed to such excess. There is in his most original and capricious movements and passages, a mixture of natural, graceful, ingenious or spirited connecting traits, which relieve the hand of the player, and the attention of the hearer.

There is no infallible receipt for invention; all a master can do is to recommend to his disciples to avoid excesses of every kind: too easy and common, too hard and uncommon; complaints of pieces being too long are more frequently made than of their being too short, which would be more flattering to a composer. When fertility is wanting, passages are frequently repeated alla tanta Rosalia, to a degree which now cannot escape remark and censure. A master cannot, nor ought if he could, tell his pupil in composition what to adopt; he can only tell him what to avoid. See *COMPOSITION*, and *COUNTERPOINT*, to which this article may serve as a supplement.

INVENTION, in *Poetry*, is applied to whatever the poet adds to the history of the subject he has chosen; as well as to the new turn he gives it.

INVENTION, in *Rhetoric*, signifies the finding out, and choosing of certain arguments which the orator is to use for the proving or illustrating his point, moving the passions, or conciliating the minds of his hearers.

Invention, according to Cicero, is the principal part of oratory: he wrote four books De Inventione, of which we have but two remaining.

This invention of the orators cannot, according to lord Bacon, be properly called invention: to invent, is to discover things not yet known, not to recollect those that are; whereas the use and office of this rhetorical invention are only, out of the stock of knowledge laid up in the mind, to select such articles as make for the purpose.

The same author divides this faculty of invention into two parts, the one *topical*, the other *promptuary*: the first points out the way in which we are to pursue the argument; the latter only lays up and disposes things, for which we have frequent occasion, in the mind.

Invention furnishes the orator with those different kinds of arguments and motives which are adapted to the various purposes he has in view. The helps of invention are a lively imagination and readiness of thought, great learning and extensive knowledge, previous consideration, and clear enlarged apprehensions of the subject. See *ARGUMENTS*, *COMMON PLACES*, and *TOPICS*, &c.

INVENTORY, in *Law*, a catalogue, or schedule orderly made of all a deceased person's goods and chattels, at the time of his death, with their value appraised by indifferent persons, which every executor or administrator is obliged to exhibit to the ordinary upon oath, if thereunto lawfully required.

By 21 Hen. VIII. c. 5. executors and administrators are to deliver in upon oath to the ordinary, intended inventories,

one part of which is to remain with the ordinary, and the other part with the executor or administrator: this is required for the benefit of the creditors and legatees, that the executor or administrator may not conceal any part of the personal estate from them. The statute ordains that the inventory shall be exhibited within three months after the person's decease; yet it may be done afterwards, for the ordinary may dispense with the time, and even with its being ever exhibited, as in cases where the creditors are paid, and the will is executed.

The use of the inventory is borrowed from the civil law: for whereas by the law of the ancient Romans the heir was obliged to answer all the testator's debts; by which means, inheritance sometimes became rather prejudicial than profitable; to obviate this inconvenience, Justinian ordained, that if the heir would first exhibit a true inventory of all the testator's effects, he should be no farther charged than to the value of the inventory.

In the British army, when any commissioned officer happens to die, or is killed on service, it is directed by the articles of war, that the major of the regiment, or the officer doing the major's duty in his absence, shall immediately secure all his effects or equipage then in camp or quarters; and shall before the next regimental court-martial make an inventory thereof, and forthwith transmit the same to the office of our secretary at war, to the end, that the executors of such officer may, after payment of his regimental debts and quarters, and the expences attending his interment, receive the overplus, if any be, to his or their use.

When any non-commissioned officer, or private soldier, happens to die, or is killed on service, the then commanding officer of the troop or company, shall, in the presence of two other commissioned officers, take an account of whatever effects he dies possessed of, above his regimental cloathing, arms and accoutrements, and transmit the same to the office of the secretary at war. These effects are to be accounted for and paid to the representative of such deceased non-commissioned officer or soldier; and in case any of the officers, so authorized to take care of the effects of dead officers and soldiers, should, before they have accounted to their representatives for the same, have occasion to leave the regiment by preferment or otherwise, they are ordered, before they be permitted to quit the same, to deposit in the hands of the commanding officer, or of the agent of the regiment, all the effects of such deceased non-commissioned officers and soldiers, in order that the same may be secured for, and paid to, their respective representatives. See Articles of War, section XIX.

INVENTORY, in *Trade*, is a list, or particular valuation of goods, &c. See **VALUE**, **APPRAISEMENT**, &c.

INVER, in *Geography*, a small river of the county of Donegal, Ireland, which is discharged into a small bay, to which it gives name. Inver bay may be considered as a part of Donegal bay, and has good anchorage. The parish is also called Inver, and there was formerly an abbey there. There is also a village called Inver in the county of Mayo, on the east side of Broadhaven, and in the wild barony of Erris.

INVERARY, a royal borough, and the county town of Argyshire, Scotland, is situated on the southern bank of Loch Fyne, where the river Aray, or Aoridh, falls into the sea. It consists chiefly of one row of commodious houses, built with great uniformity, and covered with slate. The old town was situated on the north side of the bay. It seems probable, that, prior to the fourteenth century, Inverary was little more than a small village for fishermen, who subsisted by their occupation, and erected their huts

here. About that period, the family of Argyle fixed on this site as their place of residence; and as the hereditary jurisdictions of justiciary and sheriff were vested in them, Inverary became the seat of the courts and the county town. The circuit court of justiciary is held here twice a year for the trial of offences in the counties of Argyre and Bute, and the minor courts are those of the sheriff, magistrates, and justices of the peace. It was created a royal borough by charter from king Charles I., and is governed by a provost, two bailiffs, and a council, nominated by the duke of Argyle. Its only revenue, about 30*l.* sterling annually, arises from the petty customs and the rent of a common, which, on the erection of the borough, was bestowed on it by the Argyle family. About the middle of the last century, Archibald, duke of Argyle, seeing how inadequate this revenue was to the occasions of the borough, added to it a perpetual annuity of 20*l.* secured on his estate.

Inverary is so situated in the Highlands, that as many of the inhabitants speak English as Gaelic, and two ministers officiate in these dialects. For which purpose, two new churches, under one roof, have been recently built, from a design by Mr. Milne. Inverary seems tolerably well situated for manufactures, yet none are carried on to any great extent. About the year 1748, duke Archibald introduced the linen manufacture, which has been attended with beneficial consequences. The late duke established a woollen manufacture; and erected proper buildings and machinery, which he gave to the town; but the business has not been conducted with any adequate advantage.

Inverary derives its chief source of profit from the herring fishery in Loch Fyne. This lake, which extends more than 30 miles from the Western ocean into the country, has been, from time immemorial, noted for its herrings, which are said to be superior in quality to any found in the Western seas. The fishery generally commences in July, and sometimes continues till the end of the year. During this season, the lake is frequented by innumerable shoals. The country people express the quantities of herrings abounding here, in very strong language: "At these seasons," say they, "the lake contains one part of water and two parts of fish." In this single bay five or six hundred boats are sometimes employed in the fishery; and it is estimated, that in some seasons, upwards of 20,000 barrels of herrings have been caught and cured; each barrel containing, at a medium, seven hundred fish. Part of each boat is covered with a kind of sail-cloth, to shelter the four men who compose the crew, and who seldom quit their boat during the whole season. The inhabitants of Inverary, and of the banks of the loch, do indeed spend Sunday at home; but as many of the boats come from more distant parts, the crews take up their abode entirely in them, subsisting chiefly on herrings. The night is the time of fishing; the day is employed in gutting the fish, in sleep, or in singing Celtic songs to the sound of the bagpipe. Each boat clears, on an average, from 40 to 50*l.*, and, in very productive seasons, 100*l.* The parish of Inverary extends about 18 miles in length, and about three in breadth, on an average. The number of houses in the late return to parliament was 275, of inhabitants 2045.

At a small distance from the town, is the house, or castle, of Inverary, the principal seat of the duke of Argyre, and the chief ornament of the Western Highlands. It is situated on a gentle rise, on the western side of Loch Fyne; and is surrounded by an amphitheatre of mountains, some of which are rugged and broken, and others entirely

covered with wood. The loch from this place appears like a large bay, round which are ranged plantations, covering the ground to a vast extent, from the lake to the summit of the highest mountains. The castle, rearing its towers above the woods, has a very picturesque effect; to the south-east of which, close to the bay, appears the town of Inverary in its uniform line of handsome buildings. On the right is a fine view of Dunicoich, a steep hill, 700 feet in height, covered with wood almost to the summit. Inverary House, though by no means an old structure, is built in the form of a castle, upon the plan of the mansions of some of the German nobility. The hall, which is very spacious, is hung round with arms and other ornaments adapted to the style of a Highland castle. In the election of a representative to parliament, Inverary is classed with Ayr, Irvine, Rothfay, and Campbeltown. Sinclair's Statistical Account of Scotland, vol. v.

INVERKEITHING, a royal borough and sea-port town in Fifeshire, Scotland, is situated on an eminence at the head of the bay which bears its name on the north coast of the Frith of Forth. It consists of one principal street of considerable length, with a smaller one branching from the middle of the former, and a few lanes. The houses have an ancient appearance, and almost every one has a piece of garden ground annexed to it. The return to parliament in the year 1801, stated the number of houses to be 350; of inhabitants 2228. The borough received its first charter from king William, surnamed the Lion; since whose time several kings of Scotland have granted other charters, all which were ratified and confirmed by king James VI. in a writ bearing date May 4th 1598. The civil government is vested in a provost, two bailiffs, a dean of guild, and a treasurer, all of whom are annually elected by the counsellors and deacons of trades. The latter, five in number, are also elected yearly: but the counsellors hold their office during life and residence; these must not be fewer than twenty, but are not limited to any number. The town-house, a neat structure, built in 1770, contains a prison, and rooms for the town-clerk, and for public meetings and entertainments. The bay of Inverkeithing is large and safe, and affords anchorage to vessels of any burthen in all winds. Here ships of war from the Leith roads seek shelter from the winter storms, and merchant ships from the Mediterranean used to perform quarantine. The harbour itself is a small bay; at the mouth of which, on the west side, lies a large Dutch built vessel as a lazaretto; where, instead of detaining ships from foreign parts, the particular goods supposed to be infected are immediately received, aired under the inspection of a proper officer, and delivered within a limited time to the owners. At the head of the bay is the quay, the place for landing and receiving goods; the depth of water at spring-tides is thirteen and sometimes fifteen feet. The chief employment of the vessels arises from the exportation of coal and salt. The coal is brought to the shore by a waggon road three miles in length; and 25,000 tons are annually shipped on an average: the demand is greater than can be answered; and vessels, to the number of forty or fifty, are sometimes obliged to wait several weeks for their cargo. The quantity of salt annually made is from twelve to fifteen thousand bushels. Inverkeithing was a royal residence in the time of king David I.; vestiges of his house were visible within the last fifty years. This borough joins with those of Culrofs, Queensferry, Stirling, and Dumferline, in sending a member to parliament.

On the top of Lethen-hill, near the town, are several upright stones, placed in a circular form, said to have been a druidical temple: and in the northern part of the parish is a

stone ten feet high, called the Standing stone, on which are basso relievos of several rude figures of men and horses. Within the parish is also the castle of Rosyth, a ruinous edifice, built upon a rock, and at high water entirely surrounded by the sea; it was one of the seats of the Stuart family, and is now the property of the earl of Hopetoun. The celebrated admiral Greig, commander in chief of the Russian navy, was a native of this parish. Sinclair's Statistical Account of Scotland, vol. x.

INVERNESS, a royal borough, and the county town of Invernessshire, Scotland, is situated on the shore of Moray-Frith, and is divided into two unequal parts by the river Ness, over which is a stone bridge of seven arches. It is a borough of great antiquity; and according to the best authority obtained its first charter from king Malcolm Canmore. In ancient times the townsmen maintained many desperate conflicts with the neighbouring rebellious chieftains and their clans. Traces of this state of hostility are still extant, on the west side, where irruptions were commonly made. At a small distance from the town, is a place called *Palfaire*, that is, "the Watch-Town;" also a hill, named *Tomnafaire*, "the Watch-Hill;" and a large stone, called *Clachnafaire*, "the Watch-Stone." The last charter in favour of the borough was granted by king James VI. From that period to the revolution, the inhabitants were an industrious and thriving people; carried on a considerable commerce in corn and skins; and brought the malt-ing trade to great extent; a considerable part of the town consisting of kilns and granaries. From the revolution to the year 1746, the borough suffered a gradual decline; so that, at that period, and for several years after, the town appeared little better than the ruins of its former state. In the rebellion in 1745, which commenced among the chiefs in the western part of this county, Inverness became the centre of all the military operations, and other works carried on by government. Hence it began to revive, and commerce was gradually restored. The principal manufactures now are those of hemp and flax. The first has been established about forty years; and at present employs above a thousand persons in spinning, dressing, and weaving. The raw material is imported from the Baltic, and manufactured into sail-cloth and sacking; which are sent to various parts of Britain, and the East and West Indies. A white thread manufactory has been established nearly twenty years; and employs in its various branches of heckling, spinning, twisting, bleaching, and dyeing, not less than ten thousand individuals in the town and surrounding country. The company have, in this and the neighbouring countries, several agents for the management of the spinning departments. The flax is also chiefly imported from the Baltic, and the greatest part of the thread sent to London, whence it is dispersed to different parts of the world. The cotton manufactory has been introduced here with success. Inverness possesses peculiar advantages for manufactures; the raw material being easily imported, and the manufactured goods readily exported. Dearness of fuel is the greatest obstacle, coal being imported from England. The situation of the town is highly favourable. Ships of four or five hundred tons can ride at anchor within a mile of it; and at spring tides vessels of half that burthen can come up to the quay close to the town. The principal part of the vessels belonging to Inverness, is employed in conveying to London the produce of the manufactory, also the fish caught in the river Ness, and the skins of otters, rabbits, hares, foxes, goats, roes, &c. In return, materials are brought back both for use and luxury; particularly hardware and haberdashery; with which the traders of this town supply the extensive sur-

rounding district. A spacious harbour or basin has been constructed here for vessels sailing across the island by the Caledonian canal.

Inverness is a large and well-built town; many of the houses are lofty, and assume an elegant appearance. It may be considered as the capital of the Highlands; being the only town of any importance north of Aberdeen. It was returned, under the act of 1801, as containing 1431 houses, and 8732 inhabitants. Nearly in the centre of the town stands the Court-house, connected with the Tolbooth, a handsome modern building, with a tower terminated by a spire. An academy, on a very liberal and extensive plan, was established here in the year 1790, and is supported by voluntary subscription. A piece of ground, containing about three acres, was purchased, and an appropriate building erected, consisting of a large public hall and six spacious apartments, for the accommodation of the different classes, for a library, and for philosophical apparatus. The seminary is conducted by a rector and four tutors; the number of students is generally between two and three hundred; who are divided into five classes. In the first, the English language is taught; in the second, Latin and Greek; in the third, arithmetic and book-keeping; in the fourth, geometry, trigonometry, mensuration of planes and solids; geography, navigation, and practical astronomy; naval, civil, and military architecture; gunnery, perspective and drawing; in the fifth, or highest, under the immediate care of the rector, are taught civil and natural history, experimental philosophy, and chemistry. The rector has a small house and a small salary; the tutors have still less salaries; so that their chief dependence is on the fees of their several classes, which is an incitement to attention and industry.

The civil government of the town is vested in a provost, four bailiffs, and a dean of guild, assisted by a council of twenty-one members, called the town council. The members of the new council are elected every year by the old previous to their secession from office; and the former elect from among themselves the provost, bailiffs, dean of guild, and a treasurer. There are six corporations of craftsmen, besides several crafts not incorporated. The edifices for public worship are, three national or Presbyterian churches, and one of Episcopalian, with chapels for dissenting congregations.

About half a mile from the town, on the western side, is *T'mona-heurich*, the "Hill of Fairies," a beautiful insulated hill covered with trees. It is of a singular form, nearly resembling a ship with the keel uppermost; its base is a parallelogram, in length 1084 feet, in breadth 176; from which it rises above 250 feet above the level of the river. About a mile farther from the town is another hill, called *Craig Phatric*, rugged and steep, and much higher than the former; the elevation of its highest part being 1150 feet above the bed of the river: the summit is flat, and has been surrounded by a wall eighty yards long by thirty broad. The most remarkable circumstance attending it is, that the stones are all firmly cemented together by a vitrified matter like lava, or resembling the slag or scoriae of an iron foundery; and even the stones, in many places, seem to have been softened and vitrified. The circuit court of judicatory for the northern district, comprehending the counties of Inverness, Ross, Caithness, Orkney, and Sutherland, is held at this place. *Sinclair's Statistical Account of Scotland*, vol. ix.

INVERNESS, New, a town of America, in the state of Georgia, situated on the river Altamaha, and built by a company of emigrants from the Highlands of Scotland, 130 of whom were taken over by Gen. Oglethorpe in 1734. It is about 20 miles from Frederica.

INVERNESS and Fort William Canal, was the parliamentary name first given, in the act of 1793, to an important line of canal for the passage of large ships across Scotland, principally in Invernessshire, of the designs for which we gave a full account, under that head, in our article *CANAL*, and have since added, under the topographical articles *CLACHNACHARRY* and *CORPACH*, villages at the extremities of the line, such particulars as had occurred to the time of putting these articles to the press, respecting the progress of the works: in the present article we shall have the pleasure of stating the further and successful progress, to the present time, of this very large and important undertaking, now more commonly known by the name of the Caledonian Canal. Seven annual reports have now been made by the commissioners appointed to manage this great national work, and printed by order of the house of commons; which reports contain the greatest body of minute information, satisfactorily arranged, by John Rickman, esq. the secretary to the commissioners, which has, perhaps, ever been given to the public, and shew strongly the merit which is due to Messrs. William Jessop and Thomas Telford the engineers, for the correctness of their original designs and estimates, and to the latter gentleman in particular, for carrying the whole into effect by himself and his resident assistants. From the last of these reports (ordered to be printed the 31st of May 1810), it appears, that about six miles in length at the Clachnacharry, north-eastern, or Inverness end of the line, were in hand or finished; and about the same length, at the Corpach, western or Fort-William end, were also in progress, except some particular parts, presenting no material difficulties. We shall first mention those important and expensive works, the entrance sea-locks in Loch Beauley, and in Loch Eil.

At Clachnacharry two sea-mounds, or parallel banks for inclosing the canal, have been extended more than 360 yards into the sea beyond high water-mark, and have been secured by a wall of puddled earth carried up from the bottom: and as the shore here is found to consist of wet muddy sands, capable of considerable compression by the weight of these artificial banks, the same have been extended higher than would otherwise have been necessary, and at the further extremity they have been joined into a solid mass, by filling up the space in which the sea-lock is to be constructed, and allowing time for this great weight of earth to act, in compressing the soft bottom, before the digging therein for the lock is commenced; by which the great expence and risk of a coffer-dam is to be avoided. The sea-mounds of earth, three hundred and fifty yards beyond high-water mark, and the coffer-dam for the sea-lock at Corpach, had been some months made and erected and stood firm, and at the time of making the 7th report the steam-engine and drains thereto from the scite of the lock were completed ready for commencing the excavation. The second lock at the south-east end of Clachnacharry village had been completed, except the gates, ever since 1806; the masonry of the four connected locks (Nos. 3, 4, 5, 6,) at Muirtown, N. of Inverness, were also completed, and their joints pointed with Parker's cement, prepared from the *Ludus helmontia*, or clay-balls of the London clay strata. The two locks at the N.W. end of Corpach village were long finished, all but their gates, and the masonry of the six lowest of the principal chain of eight locks near Corpach-moss were about completed. In the next most important head, that of aqueduct bridges, road arches, and culverts under the canal, one, only a small culvert, had been found necessary in the Clachnacharry district, and was finished in the lands of Kinmylies: in the Corpach district, five considerable aqueducts had been completed a long

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long time, viz. at Lower Banavie, Upper Banavie, Shangan, Muirhearlich, and Loy, all of which had their arches enlarged and paved at the bottom, or side arches constructed, in order to serve as road arches under the canal, and supersede the expence and great inconvenience of as many communications swing bridges over the canal: for which they have been found very complete substitutes. A large job of mason's work had also been completed in walling the intended wharfs, 113 yards in length, at the south-east end of the large basin intended for holding the ships which trade to Inverness, such wharfs being situate within less than a mile of the town. In the Clachnacharry district the masonry of the road bridge at Muirtown had been completed, and a temporary timber bridge laid upon it; the masonry of Baght bridge was very nearly completed, and a temporary wooden bridge had been laid over the middle of the eight Corpach-moss locks, for the road to Lochie-ferry and Fort-William, where the masonry for a swing bridge had been prepared.

Of the earth works, the stupendous embankments for the sea-locks at the extremities of the canal have been mentioned: in Kinnylies lands, W. of Inverness, a considerable embankment, across some low ground, had been very nearly completed: a more considerable and difficult embankment along the whole course of the Ness river, extends near half a mile in length, under the steep bank of Torvaine; a new channel for the river being formed south of this, and the new canal bank effectually faced with loose rubble stone to protect it from the floods: at Molindour a similar embankment along the bed of the old Ness, and the making of a new channel for it for a quarter of a mile in length, has been completed, under Torremore, a steep bank. In the lands of Doughgarroch, near the Smithy, another embankment for the canal across a loop of the river, and enlarging its channel on the further side of a gravel island were in hand. In the Corpach district, embankments of earth have been completed over each of the five aqueduct bridges mentioned above, and many smaller ones, particularly in the rugged tract between Upper Banavie and Shangan aqueducts. The principal extra cutting, or removing of earth, has been on the S.E. of Clachnacharry, where a basin of 20 acres extent, being more than one-third of a mile long, has been completed; the principal deep-cutting, partly executed in this district, being nine feet deep, for about half a mile in length, through the lands of Doughgarroch. The principal work of extra cutting in the Corpach division, has been the basin next the sea-lock, great part of which is hard rock-cutting, and was partly completed, waiting for the steam-engine to drain it: considerable deep cuttings occur on each side of the rivulet of Moy, and near several others of the aqueducts for straightening the course of the canal, and finding stuff for adjacent embankments, all of which were completed. Having thus enumerated all the principal works which had been entered on or completed, we shall present an account of the total expenditure from the commencement on the 20th of October 1803, to the third of May 1810, viz.

	£.	s.	d.
Purchase of lands and buildings, and payments on account of damage for the canal-works, roads, quarries, &c.	16,442	8	6
Labour and workmanship paid by measurement, or per job, in excavating, puddling, laking, forming temporary rail-roads, sawing, and carpenters' work	125,186	16	10 ³ / ₄
Carry over	141,629	5	4 ³ / ₄

	£.	s.	d.
Brought over	141,629	5	4 ³ / ₄
Labour and workmanship paid by the day or tide, setting out and trying the ground, whiskey for the men working in the water, &c.	5,711	10	11 ¹ / ₂
Quarries and masonry work, and for bricks, lime, and cement	70,971	14	1 ¹ / ₄
Timber, viz. foreign fir and carriage	9,310	12	7 ¹ / ₄
Native timber, purchased in the neighbourhood, felling, carriage, &c.	11,795	15	5 ¹ / ₂
	21,106	8	1 ¹ / ₄
Machinery, including four steam-engines, a saw-mill, dredging-machine, iron rails for all the temporary rail-ways, various tools and utensils, and repairing of the same, carriage, &c.	29,869	15	5 ³ / ₄
Shipping; building and rigging four sloops and barges, repairs, stores, seamen's wages, shore dues, &c. in fetching part of the stone from the distant quarries to the works	5,573	18	10 ³ / ₄
Purchase and hire of horses and provender, farriery, &c. for extra and irregular works, the superintendant's nag, &c.	811	18	0
Houses, compting-houses, sheds, stables, and other temporary buildings for the use of the superintendants, and the work	2,345	3	9
Stationery, portage, carriage of parcels, feeds for the canal banks, &c.	434	11	6 ¹ / ₂
Expences of management, viz. expences of surveys and obtaining the act, surveys and valuations of land, juries, and conveyancing: the secretary's, engineer's, and superintendant's salaries, keeping and copying accounts, reports, &c., reducing and engraving maps, &c. and travelling expences	10,998	12	2 ³ / ₄
Total	£.289,452	18	5 ³ / ₄

The British public are but little used, we are persuaded, to see such effectual checks established on the expenditure of their money, more real economy exercised, or more minute and satisfactory accounts produced, than the series of valuable reports furnish, from which we have principally extracted our accounts of this truly great national undertaking. From a careful re-estimate of what remained to be done by Mr. Jessop and Mr. Telford, a well-grounded hope is held out that the whole undertaking will be entirely completed, when the sum of 553,000*l.* is expended, except, perhaps, some purchases of land in the middle district, where no works had yet been commenced. Our inquiries further enable us to state, that at the present time (April, 1811) the excavation in hard rock for the Corpach sea-lock has been completed to 20 feet beneath high-water of neap tides, and a great proportion of the masonry of the tide-lock completed; the masonry of the great chain of eight locks near Corpach-moss is completed, and the regulating lock near Loch Lochie began: that plan, adopted for avoiding a coffer-dam to the tide lock at Clachnacharry has succeeded, a part of the space for it had been excavated, and the water which sprang in, easily commanded by a six-horse engine; and the regulating lock near Loch Ness is in hand; the number of men at present

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sent employed exceeding 1200. Mr. John Telford, the brother of the engineer, resided and superintended the works with great ability and integrity until his death, in June 1804; since which the works have been superintended by Mr. Matthew Davidson.

INVERNESS-SHIRE, one of the largest counties of Scotland, is situated on the western side of that part of the kingdom, having numerous bays of the Atlantic ocean to the west, the counties of Perth and Argyle on the south, Ross-shire and part of Moray Frith on the north, and the shires of Moray, Elgin, and Aberdeen on the east. The area thus inclosed comprizes a variety of districts, respectively named Badenoch, Lochabar, Glenelg, Glengary, Glen-Morrison, Glenshiel, &c. These are again divided into 31 parishes, and comprehended, in the year 1801, a population of 74,292 persons. A considerable proportion of the Hebrides or Western isles is also annexed to it; particularly the isles of Sky, Harris, North and South Uist, Benbecula, Barra, and Eigg, and the smaller islets which are situated on its coasts. The mainland, excluding the isles, extends in length, from the point of Arisaig on the west to that of Ardersfer on the east, where Fort George is built, about ninety-two miles, and its greatest breadth is nearly fifty. The county is divided into two almost equal parts by a valley running from south-west to north-east, parallel to the Grampians. This valley is called Glen-more-na-h'Alabin, or the "Great Glen of Albion;" and appears to be a deep fissure between the chains of enormous mountains which run in the same direction. The glen is, in the greater part of its length, filled with water; or is rather a long chain of lakes succeeding each other, and rising but little above the level of the sea; a circumstance which has suggested the propriety of taking advantage of this valley to form the canal which is now executing across the island, *viz.* the Caledonian canal. The fresh water lakes which form the chain from Inverness on the Moray Frith to the Sound of Mull below Fort William, are Loch Ness, Loch Oich, and Loch Lochie. The distance, in a direct line, is little more than fifty miles, of which nearly thirty-six are occupied by these three lakes. The salt-water lochs, or arms of the sea, which occupy the two extremities of the valley, are the Linnhe Loch, which advances from the fount of Mull, on the west, to Fort William at the mouth of the Lochie, and the Moray Frith on the east. The dimensions of the canal are, in depth 20 feet, in width, at the bottom, 50 feet, at the top 110; the locks are 20 feet deep, 170 long, and 40 broad; frigates of 32 guns may be admitted.

Loch Lochie, the most western of the fresh water lakes, is a fine piece of water, in length about fourteen miles, and from one to two in breadth. The mountains on each side are very steep, and in some parts covered with wood. The waters of this loch are chiefly derived from another to the northward, called Loch Archaig, which runs in a northern direction, sixteen miles in length, and one in breadth. From it flows the river Archaig, which, after running about a mile, falls into the northern side of Loch Lochie. The river Lochie, which takes its rise from this loch, runs westward, and falls into the sea at Fort William; its length being about ten miles, and its medium breadth about two hundred feet. It is navigable by small boats. Next to Loch Lochie, on the eastward, is Loch Oich, in length about three miles; its banks form a number of small bays, and include some beautiful little islands. It gives rise to the river Oich, which flows eastward, and soon falls into Loch Ness. This lake is twenty-two miles long, and from one to two and a half broad; its depth in the middle being from sixty to one hundred and thirty five fathoms. It sometimes, especially after

long-continued rains, rises eight or ten feet perpendicularly above low-water mark. The water possesses a peculiar quality; it never freezes in the severest winter, and in frosty weather is covered with a thick mist, which has the appearance of smoke. At the time of the great earthquake at Lisbon, Nov. 1, 1755, the water of Loch Ness was agitated in an extraordinary manner. It rose rapidly, and flowed up the lake from east to west with amazing impetuosity; the waves being carried more than two hundred yards up the river Oich, breaking on its banks five feet above the level of the river. It continued ebbing and flowing for about an hour; when a wave, much greater than the preceding, terminated the commotion, overflowing the north bank of the lake to the extent of thirty feet. From the eastern extremity of Loch Ness, rises the river of that name, which, running in an easterly direction for six miles, falls into the Moray Frith at the town of Inverness, of which its estuary forms the harbour. This chain of rivers and lakes was made the track of a series of forts, when the English government was endeavouring to subdue the aristocracy of the Highlands, and to reduce this mountainous territory under the dominion of law. The waters which fall into the eastern part of the chain of lakes, that is, below the head of Loch Oich, come chiefly from the south; the Tarff, the Errick, and the Foyers, and a variety of other torrents, which descend from the mountains, where great numbers of lakes are found. The Foyers is remarkable for its celebrated falls. This river takes its rise among the lofty mountains of Boleiskine and Abertarff, and pouring through the vale of Foyers, falls into Loch Ness nearly mid-way between the eastern and western extremities of that lake. The falls of Foyers are accurately described by Dr. Garnet in his Tour through Scotland. Respecting the upper fall, he states that "from the arch of the bridge to the surface of the water, after the lowest part of the fall, is 200 feet. Height of the fall 70 feet." Of the lower fall, distant from the former nearly half a mile, he says, "its height, in one continued stream, is 207 feet. Down this precipice the river rushes, with a noise like thunder, into the abyss below, forming an unbroken stream as white as snow. Burns has given a beautiful description of this fall. It is undoubtedly one of the highest in the world, and the quantity of water is sufficient to give it consequence. The scene is awfully grand; the celebrated cascade of Niagara in North America is not much more than half the height of this." The waters which fall into the eastern part of the lakes from the north, are chiefly the Garry, the Morrison, the Enneric, and Coiltie. The lakes may be considered as two rivers, which receive the waters of the greatest part of Inverness-shire, and convey them to the eastern and western oceans. It is said that pikes are not found in those lochs in the Highlands whose waters descend into the Atlantic; whereas they are found in those lakes whose waters flow eastward into the German ocean. The other principal rivers in this county are the Beaulie on the north, and the Spey on the south. The first, which is chiefly composed of three lesser streams, runs about eight miles before it enters the Frith of Beaulie. The river Spey rises towards the south-western part of the county out of a small lake of the same name. It receives in its course a great variety of mountain torrents; and passes through the great fir-woods of Glenmore and Strathspey; the trees of which are conveyed to the ocean by means of its waters. To the south of Loch Spey is Loch Laggan, which is fifteen miles in length, and, with its environs, forms a large district in Badenoch. On the south side is the Coill More, or Great Wood, the most considerable remnant of the great Caledonian forest. Several arms of the sea advance into the western shore of Inverness-shire;

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vernessshire; such as the foun of Sky, on which are the barracks of Bernera; Loch Houra, Loch Nevish, Loch Morven, Loch Aylert, Loch Sheil, and Loch Eil; the two last form part of the boundary between this county and Argyleshire. Our limits will not admit a particular description of the scenery to be met with in this extensive county; consisting, as the whole surface of it does, of lofty mountains, which, especially towards the west, are piled above each other in towering magnificence; and between which are deep glens of a boundless variety of forms, each of which has its stream and its lake, and many of which abound in woods. In this county stands the celebrated Ben Nevis, the highest mountain in the island of Great Britain; the altitude being no less than 4370 feet. The summit of this mountain affords a wide extent of view, from the horizon of the sea at the Moray Frith on the north-east to the island of Colonsa on the south-west. (See BEN-NEVIS.) In the eastern part of the parish of Kilmanvaig a singular curiosity appears, viz. the remarkable parallel roads of Glenroy, which are to be seen on the declivities of lofty mountains extending for seven or eight miles on each side of the water of Roy. Dr. Anderson, in his View of the Agriculture of Aberdeen, says, "these roads are carried forward along the sides of the hills in a direction every where perfectly horizontal. Wherever they come to a vacuity in the hill, there they bend inwards till they find the natural level; and where they come to a river, instead of sinking down to the level of its bottom, or requiring to have a bridge directly across it, to raise the ground to its proper level, they turn up the bank of the river, keeping still their horizontal direction, till they thus gradually reach the bottom of the stream, when, crossing it, and altering their direction once more, they pursue the course of the stream on the opposite bank till they reach the strath, when they proceed forward in the same horizontal direction as before." These parallel terraces, however, are not works of art, but natural phenomena, as suggested by Mr. Jamieson, professor of natural history in the university of Edinburgh, in his Account of the Mineralogy of Dumfriesshire. Glenroy must, at a former period, have been a lake, the surface of whose waters stood some fathoms above the highest of the parallel roads. When the river was in flood, great quantities of mud came down into the lake, but chiefly at the sides, where the current was slower than in the middle. At the lower part of the glen, however, the lake, after a lapse of ages, must have burst its barriers, so as to reduce the surface of the waters to the level of some fathoms above the second terrace. The mud formerly deposited would now become the uppermost terrace. This operation must have been thrice repeated; to produce the three parallel roads or terraces; and at last the river has burst for itself the channel which it now occupies, and has converted this ancient lake into a glen or deep valley. About eight miles from the mouth of the river Nevis is a remarkable cavern, known by the name of Haigh-t'-Hovile, or "Samuel's Cave;" that being the patronymic of the family of Glenevis. This cave is in the heart of a rock, which appears to be about 70 feet high, and nearly as broad, leaning to the side of a mount south of the river, and not far distant from it. The cave appears to have been formed by one part of the rock inclining towards the other, and forming between them an arched, irregular, shapeless kind of grotto, from six to twelve or fourteen feet in height, thirty in length, and eleven in breadth. Opposite the rock in which the cave is formed; on the other side of the river, is a beautiful cascade, falling by a gradual slope from Ben Nevis, upwards of half a mile before it reaches the bottom of

the valley, where it unites its streams with those of the Nevis. About two miles farther up the Nevis, on the cave side, is another cascade, which, after forcing its way through hills and rocks, has a fall 500 feet perpendicular. The whole vicinity, as may be expected from the number of mountains, abounds with cascades, which produce variety of picturesque scenery.

Such is the rude wildness of the mountains, rocks, and glens, that it is not wonderful the mountain chiefs and inhabitants of this country so long retained their independence. Not more than twenty years ago, a formidable banditti infested Inverness-shire. They consisted of deserters and robbers, leagued together for the annoyance of the country; but the military from the forts on the lakes being sent against them, the leaders were taken, the association was broken, and tranquillity restored.

The north-eastern corner of this county, adjacent to the Moray frith, is to be considered as a part of the Lowlands of Scotland; but all the rest of the county belongs to the Highlands. The low country contiguous to Inverness is, upon the whole, well cultivated. The rest of the eastern coast enjoys a drier climate than is to be found in the west. Considerable quantities of wheat are sown here, together with barley, oats, and peas. Potatoes are raised in great abundance, and constitute the principal food of the poorer class of inhabitants. Some rye is sown, generally mixed with oats, which gives a softness to the oat-bread of this country. In the upper parts, and in every quarter where possessions remain on the ancient small scale, agriculture is in a miserable state. In the remotest districts, the harness of a horse still consists of a bridle made of the twisted twigs of birch; with a stick put under the horse's tail, and tied with twigs, for a crupper: the saddle is a pad made of coarse sack, fastened with twisted birch twigs, or hair ropes. The mountains and forests are inhabited by immense herds of red and roe deer, which roam in safety, in recesses almost impenetrable to man: the alpine and common hare, and other game, are also abundant. The fir woods in Glenmore and Strathspey, the property of the duke of Gordon and sir James Grant, are supposed to be more extensive than all the other natural woods in Scotland together. Indeed, in every quarter are considerable forests; and there are natural plantations of great extent near the seats of the different proprietors, on the sea-coast or lakes. In the parish of Kilmalie alone, near Fort William, the wood-lands are estimated at about 14,000 acres. The trees that grow naturally are oak, fir, birch, ash, mountain-ash, holly, elm, wild green, hazle, and the Scottish poplar: those planted are larch, spruce, silver fir, beech, plane, and fruit trees. Limestone, approaching to the nature of marble, is found in every district of the county. In Lochaber, near the farm-houses of Ballachulish, is a lime-stone or marble rock of an ashen-grey colour, and of a fine regular grain or texture, capable of being raised in blocks or slabs of any size, and susceptible of a fine polish. This singular rock is sprinkled throughout with grains and specks of bright mundic or pyrites, and of lead-ore of a fine texture, which appears to be rich in silver. In the farm of Blarmacfuilnach, belonging to the duke of Gordon, about three miles to the south of Fort William, in the bed of a river, is a very peculiar kind of marble, consisting of a black ground, flowered with white. This stone is of a fine close grain, but not very hard; the flowering is light and elegant, like fine needle-work. Many of the mountains are composed of reddish granite. In the parish of Kingurie a rich vein of silver was discovered, but could never be successfully wrought; and in other places, veins of lead,

lead, with silver intermixed, have been found. Iron ore has also been discovered, but not in sufficient quantity to make it an object of manufacture.

This county contains many vestiges of antiquity. In various parts are to be seen remains of Druidical temples. At Corymony, in the northern part of the county, is one in which the middle of the circle is occupied by a cairn of loose stones, on the summit of which is one very large stone. Such temples are also found in the southern parts. Sometimes each great standing stone is supported by two other large stones buried under ground; so that where there is a single circle above, there is a double one beneath.

In the parish of Kilmanavaig is the ruined castle of Inverlochy. There was, at one time, a thriving borough of the same name adjacent to this building, which some of the old Scottish historians call the emporium of the west of Scotland; but of this borough there are no other indications than some pavement in different places, which were probably the streets of it. The castle has survived the borough, and now stands alone, a monument of ancient magnificence. It is a quadrangular building, with round towers at the angles, measuring thirty yards every way within the walls. The towers and ramparts are built of stone and lime, nine feet thick at the bottom, and eight feet above. It was surrounded by a ditch, from thirty to forty feet in breadth, which was supplied with water from the river. The whole building, including the towers, covers about 1600 square yards; and within the outside of the ditch are contained nearly 7000 square yards. At the great gate, between the south and east towers, are some remains of a draw-bridge. This gate is nine feet wide, and arched to the same height, with abutments of fourteen feet at each side. Directly opposite was another gate, of nearly the same size, which probably was designed as a water gate. Besides these two principal entries, three of the towers were provided with Sally ports; one from each, well contrived, and close to the arrow-holes, which also flanked and defended them. There is a tradition that this castle was once a royal residence; and that the league betwixt Charles the Great of France and Achaius king of the Scots was signed there on the part of the Scottish monarch, about the end of the eighth century. Within sight of Inverlochy castle stood that of Dundhardghall, on the summit of a hill about 400 yards in height. The traces of the building are still visible; and the part now remaining runs round the whole top of the hill, the compass of which is 150 yards. The part of the hall that now remains is no more than from two to four feet high, and is vitrified all round. On the northern banks of the river Lochie are the remains of an ancient castle, which, before the invention of fire-arms, was certainly a very strong place. It stands on the brink of a frightful precipice, at the bottom of which the river forces its passage through rocks, and has been secured on the land-side by a ditch and draw-bridge. The traces of the ditch are still visible. The castle of Urquhart, now fallen to decay, stands on a rocky promontory, on the west side of Loch Ness, of which it commands a view from one end to the other. The loch washes the east side of the building, and the other three sides were fortified with a strong rampart, a ditch, and a draw-bridge. Within the walls were accommodations for five or six hundred men. This castle was a royal fort, and was granted by king James IV. in 1509, with the estate and lordship of Urquhart, to the laird of Grant, in whose family they still continue. Along the chain of lochs are three forts, or military stations, designed to keep the Highlanders in subjection, Fort George, Fort Augustus, and Fort

William. The first is placed at the eastern extremity of the lakes, and prevents all entrance up the Moray frith: it is a regular fortification, and covers ten Scottish acres. Fort Augustus is situated in the middle of the chain: it has four bastions, and barracks for the accommodation of four hundred foldiers, with proper lodgings for the officers. On the west, to check any attempts from that quarter, stands Fort William, which is of a triangular form, with two bastions: this has fifteen twelve-pounders, some mortars, and a considerable armoury. It was built during the usurpation of Cromwell, under the direction of general Monk; and was then more extensive than at present, as it contained two thousand effective troops.

The remains of old watch-towers, or very small fortresses, are to be seen on the summits of many of the mountains. In the parish of Laggan is a rock, upwards of an hundred yards perpendicular height, and of very difficult access; yet on the very summit are considerable remains of a fortification. The area is about 500 feet by 253; the wall is upwards of fifteen feet in thickness. In the middle of Coil More, the great wood on the south side of Loch Erich, is a place called Aist-Merigie, or "the height on which a standard was wont to be erected." It appears to have been held sacred from the most remote antiquity, and is said to be the burial-place of seven kings of the ancient Caledonians. On a moor in Badenoch, are the remains of a square encampment; which has suggested the idea that the Romans advanced into this mountainous district: in clearing some adjacent ground some years ago, an urn was found full of ashes; also a Roman tripod.

In the parish of Kilmorack, are the ruins of the ancient priory of Beaulieu, which was founded in the year 1230, by James Bisset, of Lovat. In the parish of Petty are two circular earthen mounds; one close by the church-yard, the other about 200 yards west from it. These are evidently artificial, the outside being sod or turf, inclosing sand or light earth. The tradition concerning them is, that they were places for the administration of justice, as their name imports, being called *Tom-inhe'it*, "The Court-Hill." In the same parish are the ruins of the Castle Stewart, a large old house, belonging to the earl of Moray. In the eastern corner of the county, near the Moray Frith, is Culloden-Moor, the scene of the memorable battle which terminated the rebellion in 1745.

The modern buildings of this county worthy of observation are but few, and chiefly to be found in the north-eastern corner. The most distinguished residence in the county is Castle Grant, the seat of sir James Grant, bart. It is situated on an eminence in the parish of Cromdale, on the north side of the Spey: the apartments contain a great variety of portraits and other paintings.

The islands of Barra, Benbecula, Egg, Harris, St. Kilda, Sky, North and South Uist, which are annexed to, or connected with, this county, will be found described under their respective names. Beauties of Scotland.

INVERSE, is applied to a manner of working the rule of three, or proportion, which seems to go backward, or contrarily to the order of the common and direct rule.

In the rule of three direct, the first term is to the second as the third is to the fourth; that is, if the second be greater than the third, or less than the first, in any proportion, the fourth is less than the third in the same proportion. But in the inverse rule the fourth term is as much greater than the third, as the second is less than the first.

In the inverse rule, therefore, the proportion is not as the first is to the second so is the third to the fourth; but as the fourth

Fourth is to the first, so is the second to the third. For instance, in the direct rule we say, if three yards of tapestry cost twenty pounds, how much will six cost? The answer is, forty. In the inverse rule we say, if twenty working men make ten yards in four days, in how many days will forty do it? The answer to this, is in two days. See *RULE of Three*.

INVERSE Method of Fluxions. See *FLUXIONS*.

INVERSE Planting. See *PLANTING*.

INVERSE Proportion. See *PROPORTION*.

INVERSION, the act whereby any thing is inverted, or turned backwards.

Problems in geometry and arithmetic are often proved by inversion: that is, by a contrary rule, or operation.

INVERSION, in *Grammar*, is where the words of a phrase are ranged in a manner not so natural as they might be. For an instance: "Of all vices, the most abominable, and that which least becomes a man, is impurity." Here is an inversion; the natural order being this: impurity is the most abominable of all vices, and that which least becomes a man.

An inversion is not always disagreeable, but sometimes has a good effect.

INVERSION, in *Musical*, is often applied to the complements or supplements of intervals to the major eighth or octave; thus the major sixth is the inversion of the minor third, the minor sixth the inversion of the major third, &c. Intervals which are the inversion of each other, always have one term of their ratios common to each, and the other terms, are one the double of the other: thus $\frac{3}{2}$ and $\frac{4}{3}$, $\frac{5}{4}$ and $\frac{6}{5}$, are inversions of each other.

INVERSION, in *Rhetoric*, is a method of confutation, by which the orator shews that the reasons offered by the opposite party make for him. So when Cæcilius urged that the province of accusing Verres ought to be granted to him, and not to Cicero, because he had been his treasurer in Sicily, at the time when those crimes were committed with which he was charged, and consequently knew most of that affair; Cicero turns the argument upon him, and shews, that for that very reason, he was the most unfit of any man to be intrusted with his prosecution; since having been concerned with him in his crimes, he would certainly do all in his power to conceal or lessen them. (See *Cæcil. c. 18*.) Again, sometimes the charge is acknowledged, but the crime shifted off to another. Thus when Sextius was accused of sedition, because he had got together a body of gladiators, and brought them into the forum, where a warm engagement happened between them and Clodius's faction; Cicero owns the fact, but charges the crime of sedition upon Clodius's party in being the aggressors. (See *Pao Sext. c. 36*.) Another method made use of for the same purpose is to alleviate the charge, and take off the force of it by shewing, that the thing was not done with that intention, which the adversary insinuates. Thus Cicero in his defence of king Dejotarus (cap. 8.) owns that he had raised some forces, though not to invade the Roman territories, as had been alleged, but only to defend his own borders, and send aid to the Roman generals. See *CONFUTATION*.

INVERSION of the Uterus. See *PROLAPUS Uteri*.

INVERTED ARCH, in *Engineering*, is an arch of stone or brick, with the crown downwards, turned in the bottoms of the locks of canals, and in the bottoms of tunnels, and of aqueducts and other bridges whenever the bottom is soft or liable to give way or tear up, for securing the side walls: in locks and tunnels, the inverted arch should never be omitted. See the account of constructing these in our article *CANAL*.

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INVERTED Crescent, Point, Volt. See the substantives.

INVERTED, in *Natural History*, is a term applied to such reliquia or extraneous fossils as have a nucleus of stony matter inverted or covered by the reliquium.

INVERURY, in *Geography*, an ancient royal borough in Aberdeenshire, Scotland, is situated on the point of land formed by the confluence of the rivers Don and Ury. It is said to have been made a royal borough by king Robert Bruce, on occasion of a victory obtained by him, in this vicinity, over the English forces under Comyn, earl of Buchan. The oldest charter, however, extant, is one granted by queen Mary; the preamble of which states, that "Inverury had been a royal borough time immemorial, but the charter of its erection had been lost during the civil wars." The town is small, and its increase and improvement have been retarded by the peculiarity of its situation; it being inaccessible, excepting one side, with boats, and even that mode not always practicable. The spirited exertions of the earl of Kintore and the provost, Dr. Thom, have, in a great measure, removed this obstacle, by promoting a public subscription for building an elegant bridge over the Don, at the expence of 2000*l*.: this was completed in 1791. The borough is governed by a provost, three bailiffs, a dean of guild, a treasurer, and thirteen counsellors. The return to parliament in the year 1801, stated the number of houses to be 194, inhabited by 783 persons, of whom 641 were employed in agriculture. Inverury does not appear ever to have been a place of trade.

INVESTIGATION properly denotes the searching or finding any thing out, by the tracts, or prints of the feet.

Hence, mathematicians, schoolmen, and grammarians, came to use them in their respective researches.

INVESTIGATION of a Theme, is the art, method, or manner of finding the themes of verbs, that is, the primitive tense, mood, and person, of any verb, far removed from its source. To understand a Greek author, it is absolutely necessary to be well acquainted with the method of investigating a theme. This theme, in the Greek tongue, is the present tense of the indicative mood.

Clenard was the first who introduced this term into grammar: he gives the title *investigatio thematis* to that part where he teaches the manner of finding whence any person, or tense, or verb, proceeds, and of reducing it to its primitive word, or finding its indicative.

INVESTING, the act of conferring on any one the right or property of a fee, dignity, or office, or of ratifying and confirming what has been obtained elsewhere.

The emperors pretend to a right of investing several princes both in Germany and Italy. There was formerly a particular ceremony for the investing of bishops. After the election of a knight of the Garter, he is invested by the sovereign with two principal ensigns of the order, the Garter and George. Before his installation he is also invested with the habit of the order.

INVESTING, in the *Military Art*, signifies the opening a siege, and the encamping of an army round the place; to block up its avenues, and prevent all ingress and egress. In order to do this effectually, the general in chief of the approaching army must detach a large body of cavalry, together with the different corps of dragoons, under the command of a lieutenant-general, for the purpose of regularly investing the place. Sometimes a place is partially invested, for the sole purpose of diverting the enemy's attention from the real object, and of inducing him to weaken the garrison by detaching it to different quarters.

INVESTING, in *Common Law*, signifies the putting in possession.

possession. A tenant is invested by giving him a verge, or rod, into his hands, and administering an oath.

Others define it thus : *investire est in suum jus aliquem introducere*, to give livery of seisin, or possession. See LIVERY and SEISIN. See also FEOFFMENT.

INVESTITURE, is used both for the right, and the act, of investing a tenant, or vassal; that is, of receiving the faith and homage by which a vassal becomes seised, and possessed of a fee, by his lord. See FEE.

Investitures, in their original rise, were probably intended to demonstrate in conquered countries the actual possession of the lord; and that he did not grant a bare litigious right, which the soldier was ill qualified to prosecute, but a peaceable and firm possession. And at a time, when writing was seldom practised, a mere oral gift, at a distance from the spot that was given, was not likely to be either long or accurately retained in the memory of bystanders, who were very little interested in the grant. Afterwards they were retained as a public and notorious act, that the country might take notice of and testify the transfer of the estate, and that such as claimed title by other means, might know against whom to bring their actions.

Investiture was anciently performed by rehearsing a formula of words; afterwards by the delivery of such things as had the nearest resemblance to what was transferred. Thus, land passed by the delivery of a turf: and to shew the trees were transferred at the same time, a bough was cut and delivered along with it.

In after-times, the things by which investitures were made were not so strictly observed. Many were invested by the delivery of a staff, a glove, a knife, a piece of a cloak, of a strap, and a girdle: or by pricking the thumb, by giving the keys, a spit, a blow, a ring, a turf, a bough, a straw, &c. The investiture of a kingdom or lordship, was performed by a standard, a banner, a cap, a sword, a bow, arrows, spurs, &c.

The symbols were sometimes preserved in the repositories of the houses, and were annexed to the titles.

INVESTITURES were also used with respect to spiritual benefices. These were frequently performed by delivering the crozier and pastoral ring.

The kings of England and France, the emperor of Germany, &c. had formerly this right; so that on the death of a prelate, his clergy sent the crozier, &c. to their sovereign, to be used at the ceremony of investing his successor. It is not certain when this custom began; Cardinal Humbert places the commencement of it in the reign of Otho the Great: and it appears, that in the ninth century, the greater part of the European princes made no opposition to the right of electing the bishops, which was both claimed and exercised by the clergy and the people. The first who disputed this privilege with the emperors and sovereign princes, was Gregory VII.; he excommunicated the emperor Henry IV. and forbade all ecclesiastics, under pain of excommunication, to receive investiture at the hands of secular princes. This occasioned a long and bloody war; the civil and ecclesiastical powers being divided into two great factions, of which one maintained the rights of the emperor, while the other seconded the ambitious views of the pontiff. The laws of Gregory for the abolition of investitures were confirmed and renewed by Victor III. and Urban II. the last of whom not only confirmed the laws and anathemas of Gregory, in a council assembled at Placentia in the year 1095; but published also a prohibitory law in the council of Clermont, forbidding the bishops and the rest of the clergy to take the oath of allegiance to their respective sovereigns. Pascal II. in a council assembled at Rome, A.D.

1102, renewed the decrees of his predecessors against investitures and the excommunications they had thundered out against Henry IV. Pascal, however, was obliged, in 1111, to confirm Henry V. in the right of giving investitures; but repenting what he had done, he assembled a council in the church at Lateran, in 1112, which solemnly annulled his treaty with the emperor, who was excommunicated in many synods and councils, both in France and Germany. At length, however, Calixtus II. engaged him to renounce investiture on certain conditions, and peace was concluded between the emperor and the pope's legates, at a general diet held at Worms, A.D. 1122. This convention was confirmed the following year in the general council of Lateran, and remains still in force.

INVISCATIO, a sticking of the eye-lids together.

INULA, in *Botany*, so named by Pliny. This appellation is contracted or corrupted, says professor Martyn, from *Helenium*, Dict. *ελενιον*; fabled to have sprung from the tears of Helen. Linn. Gen. 426. Schreb. 557. Willd. Sp. Pl. v. 3. 2089. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 890. Ait. Hort. Kew. v. 3. 222. Juss. 181. Lamarck Dict. v. 3. 253. Illustr. t. 680. Gærtn. t. 170. (Enula; Cæsalp. and Magnol.—*Helenium*; Gerard. cm. 793. Vaill. Mem. Acad. Paris. 1720.) Class and order, *Syngnesia Polygamia Superflua*. Nat. Ord. *Composita Discoides*, Linn. *Corymbifera*, Juss.

Gen. Ch. *Common calyx* imbricated; scales loose, spreading, the exterior ones larger, of equal length. *Cor.* compound, radiated, broad; *florets* of the disk all perfect, equal, very numerous, funnel-shaped, with a five cleft straightish limb: those of the radius female, ligulate, numerous, crowded together, linear, entire. *Stam.* (in the tubular florets) Filaments five, thread-shaped, short; anthers cylindrical, composed of five smaller, linear, conjoined ones; each ending below in two straight bristles, the length of the filaments. *Pist.* (in the tubular florets) Germen long; style thread-shaped, the length of the stamens; stigma bifid, somewhat erect. The female or ligulate florets differ in having the style cloven but half way down, and the stigma quite erect. *Peric.* none, except the unchanged calyx. *Seeds* in the florets of the disk as well as the radius, solitary, linear, quadrangular. *Down* capillary, the length of the seeds. *Recept.* almost naked, flat.

Ess. Ch. Receptacle nearly naked. Down simple. Calyx imbricated. Florets of the radius very numerous, linear, anthers with two bristles at the base.

Obs. This genus differs not only from *Aster*, but from most others, in having the anthers terminated below by ten bristles, though this character is not apparent in all the species. *Inula* is an extensive genus, Willdenow having enumerated thirty-five species, from which number we select for description the only four which are natives of this country: these are,

1. *I. Helenium*, Elecampane. Linn. Sp. Pl. 1236. Engl. Bot. t. 1546. Woodv. Med. Bot. v. 2. t. 108.—“Leaves clasping the stem, ovate, rugged, downy beneath. Scales of the calyx ovate.”—Found in moist rich pastures and meadows in various parts of Britain, but not common, flowering in July and August. Stems about four feet high, leafy, downy, branched in the upper part. Leaves ovate, slightly serrated, veiny, downy beneath. Flowers large, terminal, of a fine golden yellow.

The ancients entertained a very high opinion of the virtues of this plant, and “in gardens it is still cultivated occasionally, for the sake of its root, which is perennial, large and fleshy, abounding with mucilage, combined with an aromatic,

matic, bitter flavour, and some acrimony. These qualities render it useful to promote expectoration.

Horace was acquainted with its fame, for we find it celebrated by that poet in two of the satires in his second book.

————— cum rapula plenus
Atque acidas mavult inulas. Sat. 2. v. 44.

And also in sat. 8. v. 51.

Erucas virides, inulas ego primus amaras
Monstravi incoquere.——

2. *I. dysenterica*. Common Fleabane. Linn. Sp. Pl. 1237. Engl. Bot. t. 1115. Curt. Lond. fasc. 3. t. 56.—“Leaves oblong, clasping the stem with their heart-shaped base, downy. Stem woolly, paniced. Calyx-scales brittle-shaped, hairy.”—Native of clear ditches and moist places, flowering in August.—Root creeping and perennial. Stem branched in a paniced or corymbose manner. Leaves waved and slightly toothed at their margin; their under side densely clothed with hoary down. Flowers numerous, terminal, of a full bright yellow. The herb is viscid to the touch, exhaling a peculiar sharpish aromatic scent, not unlike that of a peach.

Mr. Relhan mentions a variety of this species with very short rays, and Linnaeus, in the *Flora Suecica*, observes that the Russians were cured of the bloody flux by this plant, in their expedition against the Persians, whence its specific name.

3. *I. pulicaria*. Small Fleabane. Linn. Sp. Pl. 1238. Engl. Bot. t. 1196. Curt. Lond. fasc. 3. t. 57.—“Leaves clasping the stem, waved. Stem much branched, hairy. Flowers hemispherical, with a very short radius.”—Found on moist sandy heaths and commons, where water has stagnated, and flowering late in autumn.—Root annual, tapering and branched. Stem generally erect, sometimes spreading or decumbent, zigzag, angular. Leaves lanceolate or oblong, hairy on both sides. Flowers solitary, of a pale dull yellow. There is a variety of this which has scarcely any flowers of the radius.

4. *I. crithmoides*. Samphire-leaved Fleabane. Linn. Sp. Pl. 1240. Engl. Bot. t. 68.—“Leaves linear, fleshy, generally three-pointed. Calyx smooth.”—This is a maritime plant, which thrives in a muddy soil, and is rather scarce. It flowers in August.—Root perennial, fibrous. Leaves alternate, smooth and succulent, salt to the taste, those about the centre of the stem generally furnished with a tooth on each side of the tip. Flower solitary, very handsome, having yellow rays and an orange disk. Down rough, bluish-coloured.

The remaining species are *I. odora*, *Oculus Christi*, *britannica*, *indica*, *arabica*, *spiraeifolia*, *japonica*, *squarrosa*, *viscosa*, *falicina*, *grandiflora*, *glandulosa*, *bulbonum*, *hirta*, *suaveolens*, *Paillanti*, *mariana*, *dulcis*, *orientalis*, *germanica*, *ensifolia*, *provincialis*, *montana*, *asians*, *bifrons*, *cerulea*, *aromatica*, *satureioides*, *pinifolia*, *fatida*.

INULA, in Gardening, comprehends plants of the herbaceous and shrubby kinds; of which the species principally cultivated are the common inula or elecampane (*I. helenium*); the creeping-rooted inula (*I. britannica*); the willow-leaved inula (*I. falicina*); the canary inula (*I. canariensis*); the savory-leaved inula (*I. satureioides*); and the shrubby inula (*I. fruticosi*.)

There are some other sorts that may likewise be cultivated.

Method of Culture.—The first of these sorts may be propagated by seeds sown in autumn, soon after they are

ripe, on a warm, loamy, rather moist border. The plants should be transplanted to the places where they are to grow in the following autumn.

But the common practice is to increase it by offsets, which, when taken from the old roots carefully, with a bud or eye to each, take root easily: the best season is the autumn, as soon as the leaves begin to decay; planting them in rows about a foot asunder, and nine or ten inches distance in the rows. The following spring the ground should be kept clean from weeds, and be slightly dug over in the autumn following. The roots will be fit for use after two years growth, but will abide many years if permitted to stand.

The two following sorts may be increased by parting the roots, and planting them in the autumn, in the borders or other places where they are to remain. They should not be removed oftener than every three years.

The fourth and fifth sorts may be raised by planting cuttings of the branches, in the summer season, in pots of light earth, in shady borders. They must be removed into shelter in autumn, but should have as much free air as possible at all times, when the weather is mild. In cold weather the first should have but very little water, as the stalks and leaves, being succulent, are very apt to rot. In summer they should be placed abroad with other hardy exotic plants, in a sheltered situation.

The last sort is propagated by seeds procured from places where it grows naturally. These must be sown in pots, or upon a hot-bed, and when the plants are fit to remove, be each put into a small pot filled with light earth, and plunged into a fresh hot-bed; treating them in the same manner as other similar tender plants. It requires to be kept constantly in the stove.

The first sort may be cultivated for the medicinal use of the roots, or for ornament, in large borders.

The two following sorts may have places in the same way.

The fourth and fifth kinds afford variety among other potted green-house plants, and the last among stove-plants.

INULA *Helenium*, in the *Materia Medica*. See ELECAMPANE.

INVOCATION, in *Theology*, an act whereby we adore God, and call on him for his assistance.

The Romanists also practise invocation of saints, begging them to intercede with God in their behalf. This is one of the grand articles of dispute between the Romanists and the Reformed.

INVOCATION, in *Poetry*, an address at the beginning of a poem, wherein the poet calls for the assistance of some god, particularly of his Muse, or the deity of poetry. See MUSES.

This part is absolutely necessary in an epic poem, because the poet relates things which he could not be supposed to know, unless some deity inspired him. Besides, this serves his readers as an example of piety and devotion, which ought to be the foundation of this whole work. To these it may be added, that the gods themselves are to have a part in the action; and it is not decent he should set them to work, without first asking them leave.

Indeed, in the course of an epic poem, there are usually several invocations; particularly where any thing extraordinary, or miraculous, comes to be related; as that when Virgil describes the metamorphosis of Æneas's fleet into sea nymphs: but the first invocation is always the most considerable.

In the invocation Bossu considers two things: the first is what the poet requests; the second, to what deity he addresses his request. As to the first, Homer has joined the

invocation so closely to the proposition, that he seems to invoke his Muse for the whole work. But Virgil, on the contrary, only requests his Muse to furnish him with a part of his subject; and even mentions what particular part it is he desires. After proposing his matter in all its extent, he begs the Muse to acquaint him with the cause of it. See PROPOSITION.

As to the deity invoked, the same author observes, that it must always be, either the divinity that presides over poetry in general, or that which presides over the particular subject of the work. Ovid's invocation, in the *Metamorphoses*, is of the latter kind; and so is that of Lucretius; those of Homer and Virgil are of the former kind; they only invoke the Muses; and thus they distinguish between the divinities who preside over poetry, and those who preside over the actions of the poem, and have parts in it.

By the way, it may be observed, that the deities invoked are not looked on, even by the poets themselves, as divine personages from whom they expect any real assistance. Under the name of Muse they wish for the genius of poetry, and for all the qualities necessary for the execution of their design. These are mere allegories, or manners of expressing themselves poetically; just as when they personify and make gods of sleep, of rest, fame, and other natural and moral things. And thus the Muses come to be of all ages, countries, and religions; there are Pagan, Christian, Greek, Latin, and English Muses.

INVOICE, or INVOICE, a list, or account of commodities, with their value, customs, provision, charges, &c. sent by a merchant to his factor, or correspondent, in another country.

INVOICE, *Book of*. See BOOK.

INVOLUCELLUM, in *Botany*. See the following article.

INVOLUCRUM, a term adopted by Linnæus, at the suggestion of Artedi, for the row of small leaves found at the base of the umbels in most umbelliferous plants. That of the general umbel is termed the *General Involucrum*; that of each partial one a *Partial Involucrum*, in Latin *Involucellum*. The same word is used for what might be more properly called Bractæas in *Euphorbia* and other genera, and Linnæus has probably erred in reckoning the *involucrum* a species of calyx in any instance. In ferns, however, we retain this appellation for the membranous covering of their fructification, in preference to a newly invented term *indusium*.

INVOLUNTARY *Discharge of Urine*. See INCONTINENCE of Urine.

INVOLUNTARY *Motion*. See MOTION.

INVOLUTE CURVE, in the *Higher Geometry*. See EVOLUTE.

INVOLUTION, in *Algebra*, the raising any quantity from its root to any height, or power, assigned. See POWER.

Any quantity multiplied by itself, the product is the square of that quantity; the square being again multiplied by the quantity, produces its cube. See SQUARE and CUBE.

Thus if $a + b$ were to be raised to its second power, it will produce $a^2 + 2ab + b^2$.

And if it be involved again, or if that square be multiplied by the root, the cube or third power will be produced; viz. $a^3 + 3a^2b + 3ab^2 + b^3$, &c. so that the involution of any compound quantity is performed by a continual multiplication of it by itself: if the powers of $a - b$ are required, they will be found the same as those of $a + b$,

except that the terms in which the exponent of b is an odd number will be negative, because an odd number of multiplications of a negative produce a negative; or, in general, the terms of any power of $a - b$ are positive and negative by turns. See BINOMIAL Theorem.

If a quantity, consisting of three or more terms, is to be involved, it may be distinguished into two parts, which are to be raised to any power in the same manner as a binomial: and then by the same rules, the value of these compound parts may be substituted in their stead: thus,

$$a + b + c^2 = \overline{a + b + c^2}^2 = \overline{a + b}^2 + 2c \times \overline{a + b} + c^4 \\ = a^2 + 2ab + b^2 + 2ac + 2bc + c^4.$$

$$\text{And } \overline{a + b + c^2}^3 = \overline{a + b}^3 + 3c \times \overline{a + b}^2 + 3c^2 \times \overline{a + b} + c^6 \\ = a^3 + 3a^2b + 3ab^2 + b^3 + 3a^2c + 6abc + 3b^2c + 3ac^2 + 3bc^2 + c^6. \text{ The reverse of involution is called evolution. See EXTRACTION of ROOTS, and ROOT.}$$

INWARD *Flanking Angle*, in *Fortification*. See ANGLE.

JOACHIM, in *Biography*, a celebrated Italian monk, was born at Celico, near Colenza, in the beginning of the 12th century. After he had received a common education, his father obtained for him a post at the court of Naples, in which he served some time. After this he took the resolution of visiting the holy places in Palestine, left Naples, without communicating his design to his father, and reached Constantinople, where he made a short stay. While in this city he was so alarmed at the extraordinary mortality produced by a pestilential disorder, that he made a vow to renounce the world, and, having assumed the habit of a hermit, proceeded barefoot on his journey. On his return he entered into the order of Cistercians, and founded several monasteries, which he governed with great discretion. He was regarded by many of his contemporaries as a prophet, and several of his predictions were printed, in a book entitled "The Everlasting Gospel." He was author of other works, particularly of "A Harmony of the Old and New Testament." He died in the year 1202, at the age of 90. His followers wished to persuade the world that miracles were wrought at his tomb, and applied to the pope to canonize him, but this was rejected on account of the numerous errors contained in his works. Moreri. See JOACHIMITES.

JOACHIM, GEORGE, a celebrated mathematician and astronomer in the 16th century, was born, in 1514, at Feldkirk, in the Tyrol. He was educated at Zurich, where he soon discovered a strong inclination for mathematical pursuits, in the elements of which he was initiated at that place. Afterwards he went to Wittenburg, where he prosecuted his studies with ardour and success. In the year 1555 he was admitted to the degree of M. A., and in two years afterwards he was appointed joint professor of the mathematics with Reinhold. He was a zealous and able defender of the Copernican system of the world; went into Prussia, where he placed himself under the tuition of Copernicus himself, and became the editor of his great work, entitled "De Revolutionibus." While Joachim continued in Prussia, to render astronomical calculations more ready and accurate, he began an elaborate canon of sines, tangents, and secants, to fifteen places of figures, and to every ten seconds of the quadrant. He did not live to accomplish this great work, but the canon of sines for every ten seconds, and for every single second in the first and last degree of the quadrant, computed by him, was published at Frankfort in 1613, by Pitiscus; the larger work was perfected and published after his death in 1596, by his disciple Valentine Otho. Joachim returned

returned from Prussia in 1543, and was again admitted to his professorship of mathematics at Wittenburg; he afterwards was elected to fill the mathematical chair at Leipzig. He died in 1576, in the sixty-second year of his age, leaving behind him "Narratio de Libris Revolutionum Copernici;" first published at Dantzic in 1540. He also composed and published "Ephemerides," according to the doctrine of Copernicus, till the year 1551. Moreni. Hutton.

JOACHIM, *St.*, in *Geography*, a town of South America, in the kingdom of Granada, on the Mata; 240 miles E. of Santa Fé de Bogota.—Also, a town of South America, in the province of Moxes; 150 miles N.N.E. of Trinidad.—Also, a town of Canada, on the river St. Lawrence. N. lat. $47^{\circ} 5'$. W. long. $70^{\circ} 45'$.

JOACHIM *de Omaguas*, *St.*, a town of South America, in the audience of Quito, on the river Amazons; 400 miles S. E. of Quito. S. lat. $4^{\circ} 40'$. W. long. $72^{\circ} 30'$.

JOACHIMITES, in *Ecclesiastical History*, the name of a sect, the followers of one Joachim, abbot of Flora, in Calabria, who was esteemed a prophet while he lived, and left, at his death, several books of prophecies, contained in his Everlasting Gospel, commonly called the book of Joachim, besides other works; which were condemned, in 1215, by the council of Lateran; and by the council of Arles, in 1260.

One of the spiritual friars, named Gerhard, belonging to the order of Franciscans, undertook to explain the Everlasting Gospel of Joachim, in a book published in 1250, entitled "The Introduction to the Everlasting Gospel." In this work St. Francis is declared to be the angel mentioned in the Revelation, xiv. 6. who had promulgated the true and everlasting gospel of God: it is also asserted, that the gospel of Christ was to be abrogated in 1260, and this new gospel to be published in its room; and that the ministers of this signal reformation were to be humble and barefooted friars, destitute of all worldly emolument. This absurd book was suppressed by order of pope Alexander IV. in 1255, and at length publicly committed to the flames.

The Joachimites were particularly fond of certain ternaries: the Father, said they, operated from the beginning till the coming of the Son; the Son from that time to theirs, *viz.* the year 1260; and the Holy Spirit then took it up, and was to operate in his turn. Hence they divided every thing that related to men, time, doctrine, and manner of living, into three classes, or states, according to the three persons in the Trinity; every one of which states either had already, or was hereafter to succeed in its turn; and hence they called the divisions *ternaries*.

The explication given by Joachim, of the Trinity, in opposition to Peter Lombard, which was considered by many as differing little from the Arian system, procured the damnable sentence of his doctrine by Innocent III. in the council of Lateran; but notwithstanding this papal sentence Joachim has still a considerable number of adherents and defenders, more especially among those of the Franciscans, who are called Observants, or Friars observant.

JOACHIMSTHAL, in *Geography*, a town of Bohemia, in the circle of Elnbogen, celebrated for its silver mines, which were discovered in the year 1516, and which yielded from the year 1586, to the year 1601, 305,790 marks of silver; 52 miles S.S.E. of Dresden. N. lat. $50^{\circ} 20'$. E. long. $12^{\circ} 53'$.—Also, a town of Brandenburg, in the Ucker Mark; 31 miles N.N.E. of Berlin. N. lat. $53^{\circ} 5'$. E. long. $13^{\circ} 55'$.

JOAG, a town of Africa, in the country of Kajaaga; which Mr. Park supposes to have contained about 2000 inhabitants. It is surrounded by a high wall, in which is a

number of port holes, from which muskets may be fired in case of an attack; and every man's possession is likewise surrounded by a wall. To the westward of the town is a small river, on the banks of which are cultivated considerable quantities of tobacco and onions. N. lat. $14^{\circ} 25'$. W. long. $9^{\circ} 38'$.

JOAL, a town of Africa, in the kingdom of Sin, situated on the sea-coast, with a good road and anchorage; where the French had a factory for slaves, skins, ivory, and wax.

JOAN I., in *Biography*, queen of Naples, eldest daughter of Charles duke of Calabria, son of Robert king of Naples, was born about the year 1326. Her father died while she was very young, and Robert immediately betrothed her to Andrew, second son of Charles king of Hungary, who was her cousin, and who was then sent to Naples to be educated. On the death of Robert in 1643, Joan was proclaimed queen. She had already conceived a great aversion from her husband, which was increased by the idle tales of her attendants, and was now determined to hold all power in her own hands; but the pope, who was in his interest, granted a bull for the coronation of Andrew, as king in his own right. Joan was suspected of harbouring an attachment for Lewis, prince of Tarento; and she was accused of being privy to the murder of Andrew, who was taken off at the instigation of the princes of the blood, to prevent, as they thought, the kingdom from falling into the hands of the Hungarians. The king of Hungary determined to revenge himself upon the perpetrators of his brother's assassination, and advanced with a large army into Naples; the queen, who had already married the prince of Tarento, fled into Provence, and all Naples fell under the dominion of Lewis the Hungarian monarch. Joan went to Avignon, and was received with great respect by pope Clement VI. and the cardinals, before whom she underwent a formal trial on account of her husband's death. She pleaded her cause with eloquence, and was declared not only innocent, but free from all suspicion. With this decision the king of Hungary seems to have been satisfied, and immediately returned to his own dominions. Joan was now invited by the Neapolitan barons to resume her crown; she accordingly fitted out a fleet, and re-entered Naples with general acclamations in 1348. She was next engaged in a contest with the king of Hungary, which proved so much against her, that she was obliged to seek a cessation of arms, which was granted by the king, on the condition that she should abide the event of another trial before the papal court. Upon the issue of this was to be determined the possession of the kingdom of Naples. Joan now had recourse to a different kind of defence, and she pleaded in excuse that she was under the influence of witchcraft at the time, which rendered her averse from her husband, and encouraged others to conspire against him. This plea served her purpose, and she was declared blameless of all actions committed subsequent to the supposed fascination. She was left in the peaceable possession of her throne, and was again crowned, with her husband Lewis, in the city of Naples. Lewis died in 1362, and in the course of a few months she married James of Arragon, called the Infant of Majorca, whom she did not allow to assume a higher title than duke of Calabria. This prince died in 1375, and in the following year she took a fourth husband, *viz.* Otho, of the house of Brunswick, an accomplished soldier and handsome man, on whom she conferred the title of duke of Tarento, with a large estate. Having no children, the one by Andrew being dead, she adopted as a successor her relation Charles de Duras, who revolted against her at the instigation of the king of Hungary. She then adopted for her heir Lewis of France, duke of Anjou, which produced a bloody war. Charles, however, was a native prince, and being

being more agreeable to the wishes of the Neopolitans than a foreigner, he marched to Naples, and being joined by the barons, he found little or no difficulty in getting possession of the kingdom. The queen was obliged to capitulate, she was imprisoned, and after a few months was put to death. This event occurred in 1382, in the thirty-ninth year of her reign. She was a woman of great accomplishments, and possessed many good qualities, though sullied by early dissoluteness. She was the friend and patron of men of learning. Univer. Hist. Bayle.

JOAN of Arc. See ARC.

JOAN, *Pope*: a short notice must be taken of this character, as being frequently referred to, though it is now generally regarded as merely fictitious. It is said, that about the middle of the ninth century, a woman named Joan, born at Mentz, and who had received an excellent education, conceiving a violent passion for a young monk named Fulda, resolved to desert her family and friends to assume the male habit, and gain admittance into the monastery. The plan succeeded, and having long indulged in their amours undisturbed and unsuspected; they eloped together, and travelled into most of the countries of Europe, availing themselves of every opportunity for increasing their knowledge, by engaging the assistance of the best masters in the different cities through which they passed. On the death of her lover, Joan repaired to Rome, still in the dress of a man; her address, and engaging manners raised her into notice; she commenced the duties of professor, and persons of the highest rank and most considerable talents enlisted in the number of her disciples. At length, on the death of pope Leo X. in 855, she was unanimously elected his successor to the pontifical throne. So prudently did she conduct herself, and with so much ability did she perform the duties of her station, that the people had reason to congratulate themselves on their choice. At length she confided her secret to a domestic whom she took to her bed, the consequence of which was her pregnancy, and she was taken in labour at one of the most solemn processions, delivered of a child in the street, and died on the spot. It is likewise said, that to perpetuate the memory of such an extraordinary adventure, a statue was erected on the place where it happened; that in abhorrence of the crime, the pope and clergy in their subsequent annual processions from the Vatican to the Lateran have turned off from that street; and that to prevent a similar imposition, a custom was introduced of examining each pope previously to his consecration, in order to ascertain his sex. Such are the particulars of a story that seems not to have been called in question till the time of Luther, but which the best informed historians usually abandon as fictitious. "Till the reformation," says Gibbon, "the tale was repeated and believed without offence, and Joan's female statue long occupied her place among the popes in the cathedral of Sienna. She has been annihilated by two learned Protestants, Blondel and Bayle, but their brethren were scandalized by this equitable and generous criticism. Spanheim and L'Enfant attempted to save this poor engine of controversy; and even Mosheim condescends to cherish some doubt and suspicion."

JOAN D'ALBERT, queen of Navarre, daughter of Henry d'Albert, and Margaret of Valois, was born in 1528. In 1548, she married Antony of Bourbon, duke of Vendome, by whom she had, as a third son, the afterwards celebrated Henry IV. of France. At the decease of her father, in 1555, she became queen of Navarre, and her husband took the title of king. They were both favourable to the principles of the reformation, and would probably have openly professed it had they not feared the resentment of the king of France, but after his death they declared their conversion

to Calvinism, of which Joan was ever after the zealous protector. Antony, on the other hand, was fickle and weak, renounced his new faith, and was a principal commander in the civil war against the Protestants, in which he lost his life at the siege of Rouen, in 1562. Joan not only established the Protestant religion in her states, but abolished popery, and seized the property of the ecclesiastics, which she applied to the maintenance of the reformed clergy and the schools. In 1568, she quitted her states to join the chiefs of the French Protestants, and at Cognac had an interview with the prince of Condé, to whom she presented her son, then of the age of fifteen, with her jewels, as devoted to the service of the cause. She next withdrew to Rochelle, whence she wrote a pathetic letter to queen Elizabeth of England, describing the calamities and oppressions which had induced the Protestants to take up arms. She died in 1572, at Paris, whither she had come to make preparations for the marriage of her son with the sister of Charles IX. Her death was not without suspicion of poison, though the fact was never ascertained.

JOANA, in *Geography*, a town on the north coast of the island of Java, situated on a river of the same name, which is the largest and most navigable along this coast. It is here more than 20 feet deep, and about 200 feet broad. It flows out of a large inland lake, into which several small streams discharge themselves, and falls into the sea about four leagues to the westward of Rembang. The town consists of two rows of houses built along the river, about a quarter of a Dutch mile in length. The fort of Joana is a redoubt, with four demi-bastions, in which are the rice warehouses, the barracks for the foldiery, and some buildings which serve for a kitchen and other offices for the resident. The emoluments of this residency amount to 16,000 rix-dollars, or about 3500*l.* sterling. This town yields rice and timber, a little indigo and cotton.

JOANNA, JOHANNA, or *Hinzuan*, one of the Comora islands, about 30 miles long and 15 broad. The Abbé Raynal describes this island in terms of high commendation. Hills, he says, that are ever green, and valleys that are always gay, every where present a variety of delightful landscapes. Thirty thousand inhabitants, distributed into 73 villages, share its productions. They speak a corrupt dialect of the Arabic language, and their religion is a corrupt kind of Mahometanism: their moral principles are more refined than they usually are in this part of the globe. Accustomed to the plain diet of milk and vegetables, they are averse from labour. Among persons of distinction, who indulge themselves in ease and indolence, the nails of the fingers are suffered to grow to an immoderate length, and in order to give this effect of negligence the appearance of beauty, they tinge their nails with a yellow red, which they obtain from a shrub called *Alcama*, which see. Sir William Jones, who touched at this island, in his voyage to India, was much pleased with the beautiful scenery which its verdant hills and mountains, covered with elegant palms and other trees, presented to his view. He particularly mentions the town of Matamudo, distinguished at a distance by the tower of the principal mosque, and another small town called Bantasi. For an account of his rambles through part of the island, and his intercourse with some of the principal inhabitants, we must refer to his "Remarks" on this island, in the second volume of the *Asiatic Researches*. Other voyagers who have visited this island, say, that the hills are steep, covered with wood, and difficult of access, and that the valleys exhibit a few irregular plantations of cocoa-nuts. The original natives, stated at about 7000 in number, occupy the hills in the interior of the island; and they are generally at war with the Arabian interlopers, who have established themselves by conquest

quest on the sea-coast, and are said to be in number about 3000. These latter are described as poor miserable beings, who, not being able to carry on any extensive cultivation, on account of being exposed to the depredations of the mountaineer natives, subsist chiefly by supplying the Indian ships which touch there for refreshment, with a few cattle and tropical fruits. Of their ability to accommodate strangers on shore, those who have touched at the island speak in very degrading terms, as their huts or hovels are filthy and badly constructed. The huts of the poorer people are formed of twigs, interwoven with and covered by a strong coat of grass, and the roof is protected by a kind of mat, made of the leaves of the cocoa trees. People of superior rank have houses built of stone, cemented with tempered clay. The king, as he is called, or chief of the island, resides about nine miles from the town of Joanna, which contains about 200 houses, many of which are built of stone and occupied by persons of principal distinction in the island: but they are low and inconvenient: the palace of the king excepted, which is high and spacious. This chief possesses an unlimited power over his subjects, in all concerns, religious as well as temporal: he seldom visits the town except on the arrival of European vessels, when he is accompanied by a numerous equipage, and received with great attention and respect by the commanders of the ships. Every captain finds it his interest to treat him in this manner, as his permission must be obtained before any traffic can be opened with the inhabitants; and with this view he receives a small present of European manufactures. The principal domestic animals in the island are cattle, sheep, and hogs; there are several species of fowl, and different kinds of game. The sea abounds with a variety of excellent fish; and particularly with a sort of electrical fish, seven inches long, $2\frac{1}{2}$ inches broad, with a long projecting mouth, a head of a dark brown colour, the belly of sea-green, the sides yellow, and the fins and tail of a sandy-green; the body interspersed with red, green, and white spots; the eyes large, and the iris red, having its outer edges tinged with yellow. The sea-coast is wholly composed of coral rocks, which are in many places hollowed by the sea; and in those cavities several of the electrical fishes were found. See a description and drawing in the Phil. Trans. vol. lxxvi. p. 352. The natives of the island are, in general, tall, robust, and well-made; the women are inferior to the men; they have all long black hair, piercing eyes, and colour between olive and black. People of lower rank have no other covering besides a piece of cloth tied round their loins, and on their heads a cap of any stuff which they can procure. Those of higher rank wear a shirt with large sleeves, hanging down upon a pair of drawers and covering a stuff waistcoat; those of still higher orders wear turbans; and they generally have large knives attached to a belt, which passes round their middle. The women are clothed in a kind of jacket and petticoat, with a loose robe, and when they go abroad, they cover the face with a veil: they are very attentive to ornaments for their legs, arms, and ears. Their children, both male and female, are suffered to be naked till the age of seven or eight years. The inhabitants in general are commended for their simplicity, obliging disposition, and hospitality. Polygamy is allowed; so that each person has two or three wives, and as many concubines as he can maintain. S. lat. $12^{\circ} 13'$. E. long. $44^{\circ} 15'$.

JOAO, *St.*, a small island near the coast of Brazil. S. lat. 22° . W. long. $46^{\circ} 26'$.

JOAO *Fuado*, a town of Brazil, in the island of Marajo; 20 miles S.S.W. of Engenho-real.

JOAO *de Fundo*, *St.*, a town of Portugal, in Estremadura; 32 miles N.E. of Thomar.

JOAO *de Furtado*, *St.*, a town of Brazil, in the government of Para, on the Guanapu; 75 miles S.W. of Para.

JOAO *Martino*, a small island in the Indian sea. S. lat. $10^{\circ} 8'$. W. long. $42^{\circ} 54'$.

JOAO *de Monte*, *St.*, a town of Portugal, in the province of Beira; 12 miles W.S.W. of St. Viseu.

JOAO *de Nova*, a small island in the channel of Mozambique. S. lat. $16^{\circ} 58'$. E. long. $40^{\circ} 34'$.—Also, two small islands in the Indian sea. S. lat. $9^{\circ} 30'$. E. long. $49^{\circ} 14'$.

JOAO *de Pesqueira*, *St.*, a town of Portugal, in the province of Beira, on the Duero; containing two parish churches, and about 600 inhabitants; near it is a cataract on the Duero, which prevents the navigation of this river; 21 miles E.S.E. of Lamego. N. lat. $41^{\circ} 1'$. W. long. $7^{\circ} 1'$.

JOAO *de Po*, *St.*, a town of Portugal, in the province of Beira; seven miles N.E. of Braganza Nova.

JOAO *del Rey*, *St.* a town of Brazil, in the government of Menas Geraes; 80 miles S.W. of Villarica.

JOAR, a town of Africa, in the kingdom of Bursali, surrounded with palisades as a defence from wild beasts; 10 miles S. of Kower.

JOARTAM, a town and kingdom of the island of Java, in the N.E. part of the island.

JOARYA, a town of Bengal; 55 miles S. of Islamabad.

JOB, or the *Book of Job*, a canonical book of the Old Testament, containing the narrative of a series of misfortunes, which happened to a man, whose name was Job, an inhabitant of the land of Uz, supposed to be that part of Arabia Petraea which is called Idumaea, as a trial of his virtue and patience; together with the conferences he had with his cruel friends on the subject of his misfortunes; and the manner in which he was restored to ease and happiness. This book is filled with these noble, bold, and figurative expressions, which constitute the very soul of poetry.

Many of the Jewish rabbins pretend that this relation is altogether a fiction; others think it a simple narrative of a matter of fact, just as it happened; while a third class of critics own the ground-work of the story to be true, but that it is wrote in a poetical strain, and decorated with peculiar circumstances, to render the narration more profitable and entertaining. Others, again, suppose that, like some of our Saviour's parables, it is a fabulous narration designed to convey important and useful sentiments respecting the superintending providence of God, in a manner more forcible and impressive than in the form of abstract rules and precepts.

See an express dissertation on the book of Job, in the bishop of Gloucester's "Divine Legation of Moses," vol. ii. The bishop is of opinion that this book is a dramatic poem written by Ezra, some time between the return of the Jews from the captivity of Babylon, and their thorough settlement in their own country, and adapted to the circumstances of these times, by being made allegorical as well as dramatic: thus, Job, who is supposed to have been a real person, that lived a generation or two before Moses, is designed to personate the Jewish people; his three friends the three great enemies of the Jews, Sanballat, Tobiah, and Geshem, who upon their return from captivity, vexed and obstructed them in rebuilding their city and temple; Job's wife was intended by the poet to represent the idolatrous wives which many of the Jews had taken, contrary to the law, and for which they are reproved by the prophet Nehemiah.

In order to prove the composition of this book to be dramatic, the learned bishop alleges its style, which, excepting the introduction and conclusion, is in measure; its sentiments, which are delivered not only in verse but in a kind of poetry, animated by all the sublimity of figures and floridness of description, whence he concludes the whole to be a work of imagination; and the whole form of its composition. The

bishop's proof that the book of Job is no older than the time of Ezra, rests chiefly upon these two points, *viz.* his notion of an equal providence under the Mosaic dispensation, and that of the book's being an allegorical dramatic poem. The former point, which he conceives to have been the grand question discussed in this book, could be no question, in his opinion, any where out of the land of Judea; nor there neither, in any period of the Jewish nation, either before or after that in which he places it. The question he supposes to be this, whether God administers his government over men here with an equal providence, so as that the good are always prosperous, and the bad unhappy; or whether, on the contrary, there be not such apparent inequalities, as that prosperity and adversity often happen indifferently to good and bad. Job, says our author, maintains the latter part of the question, and his three friends the former. They argue these points through the whole dispute, and each party firmly adheres to his first opinion. After giving some account of the distressed condition of the Jews upon their return from the captivity, he thus proceeds: "Could any thing be conceived more seasonable and necessary at this time than such a work as the book of Job? In which, on a traditional story of great fame and reputation all over the East, a good man was represented as afflicted for the trial of his virtue, and rewarded for his afflictions; and in which their doubts about God's providence were piously resolved into his almighty power. For to quiet all their anxieties, and to comfort them under their present distresses was, I suppose, the reason of one of their prophets composing the book of Job at this very period. But if such was the end of writing this poetic story, we cannot but suppose every thing in it would be fitted to the circumstances of those times. But this could not be done without making the poem *allegorical* as well as dramatic; that is, representing the real persons of that age under the persons of the drama." That this poem is wholly allegorical the bishop argues from the divers circumstances that are added to each character, which can, by no means, belong to the persons representing; and therefore others were meant under those characters, as the persons represented. This statement he endeavours to justify and confirm by examining each character, in its reference to the person represented, beginning with Job, who represents the Jewish people; and proceeding to shew how his wife portrayed the idolatrous wives of the Jews, and how his three friends represented the three capital enemies of the Jews, above-mentioned.

The next person in this allegorical drama is the devil himself, or Satan, the author and contriver of all the mischief. This assault of Satan upon Job, says the bishop, was that which, as the prophet Zachariah tells us, (chap. ii. ver. 13. chap. iii. ver. 1, &c.) he made, at this time, on the people; "The only difference is, that, in the prophecy, Joshua the high priest stands for the people, and in this poem, Job; in all the rest, the identity is so strongly supported, that this single circumstance is alone sufficient to confirm the truth of our whole representation."—"The finding of Satan in the scene is a certain proof (says our author) that the work was composed in the age we assign to it. This evil being was little known to the people till about this time." The last person in this allegorical drama is Elihu; and Elihu, according to the bishop's statement, was Ezra, or the sacred writer himself. Such are the general outlines of the learned bishop's hypothesis, in which, it must be allowed, he has manifested a considerable degree of ingenuity, and, as we conceive, no small display of fancy. This hypothesis has been examined, and in our judgment, satisfactorily refuted in Mr. Peters' "Critical Dissertation on the Book of Job."

Le Clerc supposes that the book of Job, which, in his opinion, was a history treated in a poetical manner, or a history treated in the form of a parable, was written after the Jews were carried into Babylon, and urges, in proof of this, the frequent chaldaisms that occur in it.

The learned Grotius apprehends that this book contains a true history, treated in a poetical manner; and he was probably led to adopt this opinion from adverting to the supernatural and surprising incidents that occur in it; such as that of the sons of God presenting themselves before Jehovah, and the divine interposition at the conclusion. But as he supposed the book to be written at the distance of about a thousand years from the date of the subject of which it treats, he could scarcely imagine that there was much of true history in it. Would not a considerable difficulty in settling the time, when this book was written, be obviated, by supposing that the introductory part in the two first chapters, in which Satan makes so conspicuous a figure, (and perhaps the conclusion,) were written after the Babylonish captivity, by some writer, Ezra or another person; for, as bishop Warburton allows, Satan became more known among the Jews after their return from Babylon? Grotius farther supposes, that the events recorded in this poetical history happened in Arabia, whilst the Hebrews wandered in the desert; and that the writer, who was a Hebrew, lived before the time of Ezekiel, as he infers from that passage in his prophecy, where Job is mentioned; but after David and Solomon, from whose writings, as he conceives, some sentences and forms of speech are transferred hither; and that it was written for the use of the Edomites, transplanted to Babylon, to confirm them in the worship of the true God, and to teach them patience in adversity.

The learned writer whose sentiments we are now detailing, acknowledges that there is no mention in this book of any law but such as was traditional; nor of any point of history, besides those of the more ancient times, *viz.* before the giving of the Mosaic law; that the length of Job's life which extended to 200 years, agrees with those times; and that though the writer is unknown, it appears credible from a passage in Ezekiel, that he lived before the time of that prophet. David and Solomon might have borrowed forms of speech from the book of Job; which is no less probable than the supposition of Grotius already mentioned; and if the book was written before the time of Ezekiel, the author could not have borrowed from Daniel, Ezra, and the Chaldee paraphrasts, as Grotius seems to intimate.

Schultens ascribes the poetical, or dialogue part of this book, the style of which, he says, has all the marks of the most venerable and remote antiquity, to Job himself; the rest he supposes to be the work of some Hebrew collector. As for Le Clerc's chaldaisms, such as the termination *in* for *im*, in the plural, he says they are true Hebrew and Arabic, of the most ancient stamp. See also Grey's Job, p. 12. of the preface. Most of the Jewish doctors believe that Moses was the writer of this book; and M. Huet, with whom professor Michaelis concurs, supposes that it was written by Moses in his exile in the land of Midian; where he resided 40 years. Some have supposed that it was either written by him, or translated by him from the original Syriac, or Arabic, and that it was designed to prepare the Israelites for their exodus from Egypt, and the hardships of their future peregrination. All those learned men, who suppose this book to have been written by Moses, or Elihu, as Lightfoot imagines, or some person near the time of Job, must of course be persuaded that there is nothing in the style, which is not very consistent with this remote antiquity; and that the phrases which others take for imitations of passages in the Psalms or Proverbs, Daniel or Ezra, are rather

originals to these, and that these last are really the imitations. It is certain, whoever was the author of this book, that the style has a mixture of the Arabic. And those who have made the happiest conjectures for the solution of difficulties and the explication of particular passages, have been more indebted to the Arabic than to the Chaldee; so that the language in which it was written might have been spoken in Arabia in the days of Job. And this is the more probable, if the sons of Abraham by Keturah (from whom Job himself is supposed to be descended) were those who peopled this part of the world; for then, without doubt, they carried the language of Abraham along with them.

Mr. Peters concurs in opinion with those who believe this book to be the oldest in the world; that it was written, probably, by Job himself; and that it contains, in the main, a true history.

The eminently learned and ingenious critic, bishop Lowth, has devoted three lectures of his "Praelectiones, &c." to the examination of the book of Job. The scene of this book is laid in Idumæa; the history of an inhabitant of that country is the basis of the narrative; the characters who speak are Idumæans, or at least Arabians of the adjacent country, all originally of the race of Abraham. The language is pure Hebrew, although the author appears to be an Idumæan; for it is not improbable that all the posterity of Abraham, Israelites, Idumæans, and Arabians, whether of the family of Keturah or Ishmael, spoke for a considerable time one common language. Our learned author, discarding the sentiments of those who ascribe this book to Elihu, proceeds to examine the claims of Moses, to whom it has been more generally ascribed. This hypothesis he represents as very futile, since it is impossible to trace, throughout the whole book, the slightest allusion to the manners, customs, ceremonies, or history of the Israelites. The style of Job appears, also, to be materially different from the poetical style of Moses; being much more compact, concise, or condensed, more accurate in the poetical conformation of the sentences. He therefore avows himself inclined to favour the opinion of those, who suppose Job himself, or some contemporary, to be the author of this poem, which is the most ancient of all the sacred books, as is manifest from the subject, the language, the general character, and even from the obscurity of the work. The style of the poem favours so much of the antique, that in the judgment of the learned prelate, whoever would suppose it written after the Babylonish captivity would fall little short of the error of Hardouin, who ascribed the golden verses of Virgil, Horace, &c. to the "iron age" of monkish pedantry and ignorance.

As to the time in which Job lived, the length of his life evinces that he was before Moses, and probably contemporary with the patriarchs. That he lived at a period prior to the promulgation of the law is very probable, from the nature of the sacrifice which he institutes, conformably to the command of God, namely, seven oxen and seven rams; a respect being paid in these countries, and at that period, to that number, from the traditional accounts which were still preserved among them of the seven days of creation. The poem is founded in fact, as far as concerns the general subject of the narrative; though the whole dialogue, and probably some other parts, have partaken largely of the embellishments of poetry; but this has not by any means extended so far as to convert the whole into an allegory. The exordium and conclusion, indeed, are distinct from the poem itself, and stand in the place of an argument or illustration; but our author conceives, that they are coeval with the poetical part, and the work of the same author, because

they are indispensibly necessary to the unravelling of the plot, which is not developed in the body of the poem. Michaelis, who considers the subject of the poem as altogether fabulous, and who apprehends that it is more instructive as a fable than it possibly could be if it were a true history, cannot but regard the exordium, in which Satan appears as the accuser of Job, rather in the light of a fable than of a true narrative. It is surely incredible that such a conversation ever took place between the Almighty and Satan, who is supposed to return with *nequs* from the terrestrial regions. There are, it is true, says the learned prelate, phrases extant in the exordium, in which some critics have pretended to discover the hand of a later writer; but he is not convinced by the arguments which they produce. The principal object held forth to our contemplation in this production is the example of a good man, eminent for his piety, and of approved integrity, suddenly precipitated from the very summit of prosperity into the lowest depths of misery and ruin: who having been first bereaved of his wealth, his possessions, and his children, is afterwards afflicted with the most excruciating anguish of a loathsome disease, which entirely covers his body. He sustains all, however, with the mildest submission, and the most complete resignation to the will of Providence. "In all this," says the historian, "Job sinned not, nor charged God foolishly." And after the second trial, "In all this did not Job sin with his lips." The author of the history remarks upon this circumstance a second time, in order to excite the observation of the reader, and to render him more attentive to what follows, which properly constitutes the true subject of the poem: namely, the conduct of Job with respect to his reverence for the Almighty, and the changes which accumulating misery might produce in his temper and behaviour. Accordingly we find that another still more exquisite trial of his patience yet awaits him, and which indeed, as the writer seems to intimate, he scarcely appears to have sustained with equal firmness, namely, the unjust suspicions, the bitter reproaches, and the violent altercations of his friends, who had visited him on the pretence of affording consolation. Here commences the plot or action of the poem: for when, after a long silence of all parties, the grief of Job breaks forth into passionate exclamations, and a vehement execration on the day of his birth; the minds of his friends are suddenly exasperated, their intentions are changed, and their consolation, if indeed they originally intended any, is converted into contumely and reproaches. The first of these three singular comforters reproves his impatience; calls in question his integrity, by indirectly insinuating that God does not inflict such punishments upon the righteous; and finally admonishes him, that the chastisement of God is not to be despised. The next of them, not less intemperate in his reproofs, takes it for granted, that the children of Job had only received the reward due to their offences; and with regard to himself, intimates, that if he be innocent, and will apply with proper humility to the divine mercy, he may be restored. The third upbraids him with arrogance, with vanity, and even with falsehood, because he has presumed to defend himself against the unjust accusations of his companions; and exhorts him to a sounder mode of reasoning and a more holy life. They all, with a manifest, though indirect allusion to Job, discourse very copiously concerning the divine judgments which are always openly displayed against the wicked, and of the certain destruction of hypocritical pretenders to virtue and religion. In reply to this, Job enumerates his sufferings, and complains bitterly of the inhumanity of his friends, and of the severity which he has experienced from the hand of God; he calls to witness both God and man,

that he is unjustly oppressed; he intimates, that he is weak in comparison with God, that the contention is consequently unequal, and that be his cause ever so righteous he cannot hope to prevail. He expostulates with God himself still more vehemently, and with greater freedom, affirming, that he does not discriminate characters, but equally afflicts the just and the unjust. The expostulations of Job serve only to irritate still more the resentment of his pretended friends; they reproach him in severer terms with pride, impiety, passion, and madness: they repeat the same arguments respecting the justice of God, the punishment of the wicked, and their certain destruction after a short period of apparent prosperity. This sentiment they confidently pronounce to be confirmed both by their experience and by that of their fathers; and they maliciously exaggerate the ungrateful topic, by the most splendid imagery and the most forcible language. On the part of Job, the general scope of the argument is much the same as before, but the expression is considerably heightened; it consists of appeals to the Almighty, asseverations of his own innocence, earnest expostulations, complaints of the cruelty of his friends, melancholy reflections on the vanity of human life, and upon his own severe misfortunes, ending in grief and desperation: he affirms, however, that he places his ultimate hope and confidence in God; and the more vehemently his adversaries urge, that the wicked only are objects of the divine wrath, and obnoxious to punishment, so much the more resolutely does Job assert their perpetual impunity, prosperity, and happiness even to the end of their existence. The first of his opponents, Eliphaz, incensed by this assertion, descends directly to open crimination and contumely; he accuses the most upright of men of the most atrocious crimes, of injustice, rapine, and oppression; inveighs against him as an impious pretender to virtue and religion, and with a kind of sarcastic benevolence exhorts him to penitence. Vehemently affected with this reproof, Job, in a still more animated and confident strain, appeals to the tribunal of All-seeing Justice; and wishes it were only permitted him to plead his cause in the presence of God himself. He complains still more intemperately of the unequal treatment of Providence; exults in his own integrity, and then more tenaciously maintains his former opinion concerning the impunity of the wicked. To this another of the triumvirate, Bildad, replies, by a masterly, though concise, dissertation on the majesty and sanctity of the Divine Being, indirectly rebuking the presumption of Job, who has dared to question his decrees. In reply to Bildad, Job demonstrates himself no less expert at wielding the weapons of satire and ridicule, than those of reason and argument; and reverting to a more serious tone, he displays the infinite power and wisdom of God more copiously, and more poetically than the former speaker. The third of the friends making no return, and the others remaining silent, Job at length opens the true sentiments of his heart concerning the fate of the wicked; he allows that their prosperity is unstable, and that they and their descendants shall at last experience on a sudden, that God is the avenger of iniquity. In all this, however, he contends that the divine counsels do not admit of human investigation; but that the chief wisdom of man consists in the fear of God. He beautifully descants upon his former prosperity; and exhibits a striking contrast between it and his present affliction and debasement. Lastly, in answer to the crimination of Eliphaz, and the implications of the others, he relates the principal transactions of his past life; he asserts his integrity as displayed in all the duties of life, and in the sight of God and man; and again appeals to the justice and omniscience of God in attestation of his veracity.

When Job's three friends have ceased to dispute with Job, "because he seemeth just in his own eyes," that is, because he has uniformly contended, that there was no wickedness in himself which could call down the heavy vengeance of God; Elihu comes forward justly offended with both parties; with Job, because "he justified himself in preference to God," that is, because he defended so vehemently the justice of his own cause, that he seemed in some measure to arraign the justice of God; against the three friends, because, "though they were unable to answer Job, they ceased not to condemn him," that is, they concluded in their own minds that Job was impious and wicked, while, nevertheless, they had nothing specific to object against his assertions of his own innocence, or upon which they might safely ground their accusation.

The conduct of Elihu evidently corresponds with this state of the controversy: he professes, after a slight prefatory mention of himself, to reason with Job, unbiassed equally by favour or resentment. He therefore reproves Job from his own mouth, because he had attributed too much to himself; because he had affirmed himself to be altogether free from guilt and depravity; because he had presumed to contend with God, and had not scrupled to insinuate that the Deity was hostile to him. He asserts, that it is not necessary for God to explain and develop his counsels to men; that he nevertheless takes many occasions of admonishing them, not only by visions and revelations, but even by the visitations of his Providence, by sending calamities and diseases upon them, to repress their arrogance and reform their obduracy. He next rebukes Job, because he had pronounced himself upright, and affirmed that God had acted inimically, if not unjustly towards him, which he proves to be no less improper than indecent. In the third place, he objects to Job, that from the miseries of the good, and the prosperity of the wicked, he has falsely and perversely concluded that there was no advantage to be derived from the practice of virtue. On the contrary he affirms, that when the afflictions of the just continue, it is because they do not place a proper confidence in God, ask relief at his hands, patiently expect it, nor demean themselves before him with becoming humility and submission. This observation alone, he adds very properly, is at once a sufficient reproof of the contumacy of Job, and a full refutation of the unjust suspicions of his friends. Lastly, he explains the purposes of the Deity in challenging men, which are in general to prove and to amend them, to repress their arrogance, to afford him an opportunity of exemplifying his justice upon the obstinate and rebellious, and of shewing favour to the humble and obedient. He supposes God to have acted in this manner towards Job; on that account he exhorts him to humble himself before his righteous Judge, to beware of appearing obstinate or contumacious in his sight, and of relapsing into a repetition of his sin. He intreats him, from the contemplation of the divine power and majesty, to endeavour to retain a proper reverence for the Almighty. To these frequently intermitted and often repeated admonitions of Elihu, Job makes no return.

The speech of Elihu is followed by the address of God himself: at the close of which, Job humbly submits to the will of Providence, acknowledges his own ignorance and imbecility, and "repents in dust and ashes."

On a due consideration of all these circumstances, the principal object of the poem seems to be this third and last trial of Job, from the injustice and unkindness of his accusing friends. The consequence of which is, in the first place, the anger, indignation, and contumacy of Job, and afterwards his compofure, submission, and penitence. The

design of the poem is, therefore, to teach men, that having a due respect to the corruption, infirmity, and ignorance of human nature, as well as to the infinite wisdom and majesty of God, they are to reject all confidence in their own strength, in their own righteousness, and to persevere on all occasions an unwavering and unfulfilled faith, and to submit with becoming reverence to his decrees.

The whole history detailed in the book of Job, taken together, contains an example of patience, together with its reward.

Our author next proceeds to inquire whether the poem of Job be possessed of the peculiar properties of the Greek drama: and after considering a variety of circumstances, he affirms without hesitation, that the poem of Job contains no plot or action whatever, not even of the most simple kind: it uniformly exhibits one constant state of things, without the smallest change of feature from the beginning to the end; and contains nearly a representation of those manners, passions, and sentiments, which might actually be expected in such a situation. The very nature of the subject excludes even the possibility of a plot or action. Upon the whole, our author concludes, that the poem of Job cannot properly be brought into comparison with any of the Greek tragedies. But though it has no claim to the merit of a perfect drama, our author does not wish to derogate from its merits. That censure will rather apply to those who, by criticising it according to foreign and improper rules, would make that composition appear lame and imperfect, which, on the contrary, is in its kind most beautiful and perfect. If indeed the extreme antiquity of this poem, the obscurity and the difficulty that necessarily ensue from that circumstance be considered; and if allowance be made for the total want of plot and action, we shall have cause to wonder at the elegance and interest which we find in its form, conduct, and economy. The arrangement is perfectly regular, and every part is admirably adapted to its end and design. The antiquary or the critic, who has been at the pains to trace the history of the Grecian drama from its first weak and imperfect efforts, and has carefully observed its tardy progress to perfection, will scarcely, without astonishment, contemplate a poem produced so many ages before, so elegant in its design, so regular in its structure, so animated, so affecting, so near to the true dramatic model: while, on the contrary, the united wisdom of Greece, after ages of study, was not able to produce any thing approaching to perfection in this walk of poetry before the time of Æschylus. But however this be—whatever rank may be assigned to Job, in a comparison with the poets of Greece, to whom we must at least allow the merit of art and method; amongst the Hebrews, it must certainly be allowed, in this respect, to be unrivalled. It is of little consequence whether it be esteemed a didactic or an ethic, a pathetic or dramatic poem; only let it be assigned a distinct and conspicuous station in the highest rank of the Hebrew poetry.

The most splendid examples, says our author, of every beauty and elegance of sentiment, of imagery, and of diction, meet the eye of the attentive reader in every part of the poem. Let it suffice to say, that the dignity of the style is answerable to that of the subject; its force and energy to the greatness of those passions which it describes: and as this production excels all the other remains of the Hebrew poetry in economy and arrangement, so it yields to none in sublimity of style, and in every grace and excellence of composition. Among the principal of these may be accounted the accurate and perfectly poetical conformation of the sentences, which is indeed generally most observable in the most ancient of the poetical compositions of the He-

brews. Here, however, as is natural and proper in a poem of so great length and sublimity, the writer's skill is displayed in the proper adjustment of the period, and in the accurate distribution of the members, rather than in the antithesis of words, or in any laboured adaptation of the parallelisms.

"The poetry of the book of Job," says Dr. Blair, "is not only equal to that of any other of the sacred writings, but is superior to them all, except those of Isaiah alone. As Isaiah is the most sublime, David the most pleasing and tender, so Job is the most descriptive of all the inspired poets. A peculiar glow of fancy, and strength of description, characterize this author. No writer whatever abounds so much in metaphors. He may be said, not to describe, but to render visible, whatever he treats of. Instances every where occur; particularly in the 18th and 20th chapters, in which he paints the condition of the wicked." Schultens and Le Clerc's *Præf. ad Comment. in Job.* Lowth de Sac. Poet. *Prælectiones* 32—34. Gregory's *Transl. with Michaelis's Notes.* Peter's *Crit. Differt.* Dupin. Heath, Scott, and Grey on Job. Blair's *Lect.* vol. iii. Dr. Stock, bishop of Killala, in his translation and notes, concurs with those who refer this book to a late period; not earlier than the Babylonish captivity.

Job's Tears, in Botany. See COIX.

Job, St., in Geography, a town of Hungary, near which are a celebrated abbey, and an old castle; 24 miles S.E. of Debreczin.

JOBAB, a town of Hindoostan, in the Gurry Munde'ah; 30 miles S. of Gurrah.

JOBBER, a person who undertakes jobs, or small pieces of work.

In some statutes, jobber is used for a person who buys and sells cattle for others. See BROKER.

JOBGING, Stock, denotes the practice of trafficking in the public funds, or of buying and selling stock, with a view to its rise or fall. The term is commonly applied to the illegal practice of buying and selling stock for time, or of accounting for the differences in the rise or fall of any particular stock for a stipulated time; whether the buyer or seller be possessed of any such stock or not. See *Stock* BROKERS.

JOBGING, in Rural Economy, a term used by farmers for a petty sort of buying and selling, or dealing in cattle, or any other sort of farming-stock. Men of this kind are also frequently employed by the larger dealers. It has been observed, that "if a midland farmer goes to a fair, he is ashamed to return without having 'done some business:' he must either buy or sell, or he loses his credit as a market man. Hence, probably, the quantity of business done at the midland fairs, compared with those of other districts, where one-third, or perhaps half, the stock is frequently unsold, is very considerable, while here, the whole fair may be said to be generally transferred."

JOBERT NAILS. See NAILS.

JOBERT, LEWIS, in Biography, a French Jesuit, distinguished as well by his antiquarian knowledge, as by his pulpit talents and eloquence, was born at Paris in the year 1637. He was a teacher of the several branches of polite literature, and performed the duties of his station with distinguished ability. He died in 1719, leaving behind him many works, but the most important was an elaborate treatise on "Medals," which was published in two volumes, 12mo., in the year 1692. This work possesses great merit, and met with a very favourable reception. It has gone through many editions at Paris, Amsterdam, Leipzig, and Nuremberg. The most correct is said to be that of Paris in 1739, with additions by M. Joseph Bimard de la Baillie. Moreri.

JOBIE, in *Geography*, an island in the Pacific ocean, at the entrance of a great bay on the coast of New Guinea; 110 miles long from E. to W., and from 6 to 20 broad. S. lat. $1^{\circ} 36'$ to 2° . E. long. $135^{\circ} 50'$ to $137^{\circ} 36'$.

JOCALLA, a town of Peru, in the diocese of La Paz; 9 miles N. of Potofi.

JOCHER, CHRISTIAN GOTTLIEB, in *Biography*, doctor of theology, public professor of history at Leipzig, and librarian to the academy, was born in that city in 1694. Having received the elements of an excellent education at different schools, he devoted himself to the study of theology, and obtained his degrees at Leipzig. He soon became a disciple of Leibnitz and Wolf, and was the first person who gave lectures on the system of Wolf. He soon attracted a numerous concourse of pupils, and was most assiduous in his instructions. To render his lectures as useful as possible, he studied incessantly, so as to injure his health. In 1720 his father died in distressed circumstances, which obliged the son to exert all his powers for his support: he became the editor of the German "Acta Eruditorum," which he conducted with great spirit till the year 1739. In 1730 he was appointed professor of philosophy, then of history, and in 1742 he obtained the office of librarian to the university. He died in 1758, much esteemed as a man of letters and a good teacher. He possessed an extensive knowledge in the various branches of literature and science, and was acquainted with the best writers on the several subjects. His principal work was "A Compendious Dictionary of learned Men," arranged alphabetically. This went through four editions in the author's life time, of which the last was extended to four volumes quarto. Two supplementary volumes, which go as far as I, have been since published by Adelung, entitled "A Continuation of, and Supplement to Jocher's General Dictionary of learned Men." Gen. Biog.

JOCKEY, in the management of horses; the person who trims up, and rides about horses for sale.

JOCKGRIM, in *Geography*, a town of France, in the department of the Lower Rhine, situated on an eminence near the Rhine; 9 miles S.E. of Landau.

JOCKLET, or **YOCKLET**, a term used in some parts of Kent for a little farm which requires but one yoke of oxen to till it.

JOCKMOCKI, in *Geography*, a town of Sweden, in the lapmark of Lulea; 90 miles N.N.W. of Lulea.

JOCKO, in *Zoology*. See *SIMIA Satyrus*.

JOCRONS, in *Geography*, a town of Hindoostan, in Myfore; 20 miles N.N.E. of Chitteldroog.

JODELLE, STEPHEN, in *Biography*, a nearly French poet, was born at Paris in 1532, of a family of some rank. He was a man of various talents, skilled in the ancient languages, and conversant in the arts of painting, sculpture, and architecture, as well as dextrous in the use of arms; but his chief excellence was in poetry. He is said to have made five hundred Latin verses in one night. He was the first person who introduced tragedy and comedy in the ancient form into French poetry. His *Cleopatra* is the earliest of French tragedies, and was acted with great applause before Henry II. and all the great men of France. It is simple in its plan, and provided with a perpetual chorus in imitation of the ancient style. The comedies of this writer are said to be superior to his tragedies; he was undoubtedly popular in his day, but was, notwithstanding, suffered to fall into indigence, to which his carelessness and love of pleasure contributed. He died in 1573, at the age of 41, and upon his death-bed he dictated a sonnet to Charles IX., containing severe reproaches for deserting him in necessity. His works have been published collectively at Paris and Lyons.

JODO, in *Geography*, a town of Japan, in the island of Niphon; 5 miles S. of Meaco.

JODOIGNE, a town of France, in the department of Dyle, and chief place of a canton, in the district of Nivelles: the place contains 2012, and the canton 14,434, inhabitants, on a territory of 165 kilometres, in 28 communes.

JOEL, or *the Prophecy of Joel*, a canonical book of the Old Testament. Joel was the son of Pethuel, and the second of the twelve lesser prophets. The style of this prophet is elegant, perspicuous, copious, and fluent; he is also sublime, animated, and energetic. In the 1st and 2d chapters he displays the full force of the prophetic poetry, and shews how naturally it inclines to the use of metaphors, allegories, and comparisons. Nor is the connection of the matter less clear and eminent than the complexion of the style. But after allowing him perspicuity both in language and arrangement, it cannot be denied, that there is sometimes great obscurity in his subject, and particularly in the latter part of his prophecy. About the beginning of the last century, Herman Von der Handt, the Hardouin of Germany, attempted to reduce Joel's allegories, as he calls them, to Iambic verse. Joel upbraids the Israelites for their idolatry, and foretels the calamities they should suffer as the punishment of that sin: but he endeavours to support them with the comfort that their miseries should have an end upon their reformation and repentance. Some writers, inferring the order of time in which the minor prophets lived from the order in which they are placed in the Hebrew copies, conclude that Joel prophesied before Amos, who was contemporary with Uzziah, king of Judah. Archbishop Usher makes this inference from Joel's foretelling that drought, chap. i. which Amos mentions as having happened, chap. iv. 7, 8, 9. If we consider the main design of Joel's prophecy, we shall be apt to conclude, that it was uttered after the captivity of the ten tribes; for he directs his discourse only to Judah, and speaks distinctly of the sacrifices and oblations that were daily made in the temple.

Bishop Newcome, adopting the conjecture of Drusius, supposes that he lived under the long reign of Manasseh, and before his conversion; that is, some time from 697 to 660 B. C. Lowth's Com. Lowth's Præl. xxi. Newcome's Attempt towards an improved Version, &c. of the Twelve Minor Prophets.

JOGHIS, a sect of heathen religious in the East Indies, who never marry, nor hold any thing in private property; but live on alms, and practise strange severities on themselves.

They are subject to a general, who sends them from one country to another to preach: they are, properly, a kind of penitent pilgrims; and are supposed to be a branch of the ancient Gynnosophists.

They frequent, principally, such places as are consecrated by the devotion of the people, and pretend to live several days together without eating or drinking. After having gone through a course of discipline for a certain time, they look upon themselves as impeccable, and privileged to do any thing; upon which they give a loose to their passions, and run into all manner of debauchery.

JOGHY-COOPA, in *Geography*, a town of Affan; 90 miles N.W. of Gerghonge.

JOGUES, or **YOGGS**, certain ages, eras, or periods, of extraordinary length, in the chronology of the Hindoos. They are four in number; of which the following is an account, extracted from Halhed's Preface to the Code of Gentoo Laws, p. 36.

1. The *Suttee Jogue* (or age of purity), is said to have lasted three million two hundred thousand years; and they hold

hold that the life of man was extended in that age to one hundred thousand years, and that his stature was twenty-one cubits.

2. The *Tirtah Jogue* (in which one-third of mankind was corrupted), they suppose to have consisted of two million four hundred thousand years, and that men lived to the age of ten thousand years.

3. The *Dwapaar Jogue* (in which half of the human race became depraved), endured one million six hundred thousand years, and the life of man was then reduced to a thousand years.

4. The *Collee Jogue* (in which all mankind are corrupted, or rather lessened, for that is the true meaning of *Collee*), is the present era, which they supposed ordained to subsist four hundred thousand years, of which near five thousand are already past; and the life of man in that period is limited to one hundred years. See HINDOOS.

We shall here subjoin Dr. Robertson's observations on the above periods, from the Notes to his *Historical Disquisition* concerning India.

"If (says he, p. 360.) we suppose the computation of time in the Indian chronology to be made by solar, or even by lunar years, nothing can be more extravagant in itself, or more repugnant to our mode of calculating the duration of the world, founded on sacred and infallible authority. From one circumstance, however, which merits attention, we may conclude that the information which we have hitherto received concerning the chronology of the Hindoos is very incorrect. We have, as far as I know, only five original accounts of the different jogues, or eras of the Hindoos. The first is given by M. Rogers, who received it from the Brahmins on the Coromandel coast. According to it, the *Suttee Jogue* is a period of one million seven hundred and twenty-eight thousand years; the *Tirtah Jogue* is one million two hundred and ninety-six thousand years; the *Dwapaar Jogue* is eight hundred and sixty-four thousand. The duration of the *Collee Jogue* he does not specify. (Porte Ouverte, p. 179.) The next is that of M. Bernier, who received it from the Brahmins of Benares. According to him the duration of the *Suttee Jogue*, was two million five hundred thousand years; that of the *Tirtah Jogue*, one million two hundred thousand years; that of the *Dwapaar Jogue* is eight hundred and sixty-four thousand years. Concerning the period of the *Collee Jogue*, he likewise is silent. (Voyages, tom. ii. p. 160.) The third is that of colonel Dow; according to which the *Suttee Jogue* is a period of fourteen million of years; the *Tirtah Jogue* one million eighty thousand; the *Dwapaar Jogue* seventy-two thousand; and the *Collee Jogue* thirty-six thousand years. (Hist. of Hindost. vol. i. p. 2.) The fourth account is that of M. le Gentil, who received it from the Brahmins of the Coromandel coast; and as his information was acquired in the same part of India, and derived from the same source with that of M. Rogers, it agrees with his in every particular. (Mem. de l'Academ. des Sciences, pour 1772 tom. ii. part i. p. 176.) The fifth is the account of Mr. Halhed, which has been already given. From this discrepancy, not only of the total numbers, but of many of the articles in the different accounts, it is manifest that our information concerning Indian chronology is hitherto as uncertain as the whole system of it is wild and fabulous. To me it appears highly probable, that when we understand more thoroughly the principles upon which the factitious eras or jogues of the Hindoos have been formed, we may be more able to reconcile their chronology to the true mode of computing time, founded on the authority of the Old Testament; and may likewise find reason to conclude, that the account given by their astronomers of the

situation of the heavenly bodies at the beginning of the *Collee Jogue*, is not established by actual observation, but the result of a retrospective calculation."

JOHADINGA, in *Geography*, a town of Bengal; 32 miles N.E. of Calcutta.

JOHAN, ST., a town of France, in the department of the Sarre, on the Sarre, communicating by a bridge with Saarbruck.—Also, threetowns in the duchy of Stiria.—Also, a town of the archbishopric of Salzburg; 30 miles S.S.E. of Salzburg.

JOHAN-GEORGEN-STADT, a town of Saxony, in the circle of Erzgebürg, founded in 1654 by the Protestant miners, who were driven from Platten in Bohemia, and so named after John George I. The corn, cultivated near the town, is inconsiderable, but the breed of cattle is good. The men are employed in mining, and the women in weaving lace. Ores of tin and silver have been formerly found near this place. Copper ore, cobalt, emery, and other minerals are now found; 24 miles S. of Chemnitz. N. lat. 50° 23'. E. long. 12° 40'.

JOHANNES, a small island in the Pacific ocean, discovered in 1767. N. lat. 6° 50'. E. long. 132° 18'.

JOHANNESBERG, or BICHOFESBERG, a town of Germany, famous for its wine; 16 miles W. of Mentz.

JOHANNESBURG, a town of Prussia, in the province of Natangen, near the Spirding lake; 96 miles S.S.E. of Königsberg. N. lat. 53° 22'. E. long. 22° 2'.

JOHANNIS, ST., a town of Austria; 11 miles S.S.E. of Glaggnitz.—Also, a town of Austria; 8 miles E. of Bavarian Waidhoven.

JOHANSTHAL, a town of Moravia, in the circle of Prerau, situated in Silesia; 12 miles N.N.W. of Jagendorf.

JOHN the BAPTIST, in *Scripture Biography*, was the son of Zacharias, a priest of the course of Abia, and of Elizabeth, cousin to Mary, the mother of our Saviour. He was announced before his birth to Zacharias, who received instructions to call him John, and who was apprized of the high and honourable character which he was to sustain, as the forerunner of the Messiah. See the account of his birth and office in the first chapter of St. Luke's Gospel. Having withdrawn himself from society, in order to prepare, by exercises of devotion, and strictness of manners, for the duties of the office which was assigned him, he was called to commence his ministry when he was about thirty years of age; and, like the ancient prophets, he quitted his solitude in a garment of camel's hair, and distinguished himself by abstinence and self-denial, and severity of morals. His commission was to proclaim the approaching advent and kingdom of the Messiah, and to qualify men, by repentance and reformation, for becoming partakers of the blessings which the great teacher and saviour was empowered to bestow. The success of his preaching was such, that multitudes resorted to hear him, and to be baptised by him in the waters of Jordan. His reputation was such among the people, that many began to debate among themselves, whether he was not the Messiah: and when the Jewish Sanhedrim, hearing of his fame, sent scribes and pharisees from Jerusalem to examine his pretensions, John thought it sufficient honour to be commissioned as the forerunner of the Messiah, and therefore explicitly declared that he was not the Messiah himself. At the appointed time Jesus came to him from Nazareth, and after some hesitation, first from ignorance of his person and character, and afterwards, from humility and diffidence, John performed for him the religious rite of baptism, according to

to his request. As soon as this service was concluded, John had ample evidence presented to him of the dignity and real character of Jesus; for a lambent flame descended upon him with a kind of hovering dove-like motion, and a voice from heaven accompanied it, proclaiming "This is my beloved Son, in whom I am well pleased." John, being thoroughly satisfied that Jesus was the promised and expected Messiah, eagerly embraced every opportunity that occurred of announcing him to the multitude, which attended his ministry, under this character. The disciples of John became jealous of the increasing fame of Jesus; and fearful that the reputation and influence of their master would decline: but John corrected their misapprehensions, acknowledged his inferiority to Jesus, and directed the people to transfer their views and regard from him, who was merely the forerunner of the Messiah and Saviour, to the person who really sustained this high character, and to whom these honourable appellations belonged. In the course of John's ministry his fame commanded the attention of Herod, tetrarch of Galilee, and induced him to send for the preacher to his court; for some time his instruction and counsel seemed to impress the tetrarch's mind, and to give him pleasure. But the fidelity of John would not permit Herod to form an incestuous connection with Herodias, his brother's wife, without seasonable animadversion and severe reproof. The tetrarch resented the faithful reprehension of John, and committed him to prison. During the interval of his confinement, Herodias was plotting his death: but Herod, for some time, partly from reverence for John, and partly from a dread of the people, who believed him to be a prophet, resisted the machinations of Herodias. An opportunity at length occurred, upon the birth-day of Herod, for the execution of the cruel purpose which this wicked woman had formed against John. Her daughter, by her former husband, danced before the assembly that was convened in honour of his nativity, so much to the satisfaction of Herod, that he promised with an oath to grant her whatsoever she requested, even though it should be to the value of half his kingdom. The princess, instructed by her mother, requested that the head of John the Baptist should be delivered to her in a charger, or large dish. Herod was for some time reluctant; but upon her persisting in her request, Herod complied, and ordered John to be beheaded in the prison. The death of John the Baptist is mentioned by Josephus in a passage, the genuineness of which is generally admitted by learned men. A dispute had arisen between Aretas, king of Petra, the father of his first wife, whom he had put away for the sake of Herodias, which was partly owing to this conduct, and partly to some difference that took place between them about the limits of their respective territories. In a contest between them Herod's whole army was defeated; and this defeat, says Josephus, was considered by some of the Jews as a just punishment providentially inflicted on Herod, for the death of John, called the Baptist. For Herod, continues the Jewish writer, had killed him who was a just man, and had called upon the Jews to be baptised, and to practise virtue, exercising both justice towards men, and piety towards God: for so would baptism be acceptable to God, if they made use of it, not for the expiation of their sins, but for the purity of the body; the mind being first purified by righteousness. And many coming to him, for they were wonderfully taken with his discourses, Herod was seized with apprehensions, lest, by his authority, they should be led into sedition against him, for they seemed capable of undertaking any thing by his direction, &c. (Antiq. l. xviii. c. 5. § 1, 2.) It has been said by some persons, that this paragraph contradicts our evangelists: for, according to them, it was at the solicitation of He-

rodias and her daughter that John was beheaded. But here it is said, that Herod put John to death because he feared that he might be the cause of a sedition. But the two accounts are by no means inconsistent: for Herod might have apprehensions from John's popularity, and be disposed, on that account, to take him off. See Lardner's Works, vol. vii. p. 117. The festival of the nativity of John the Baptist was appointed to be observed in the Christian church on the 24th of June: the date of the first appointment is not known: but that it is to be placed before the end of the fourth century, appears from the sermons of St. Augustine, adapted to the day.

JOHN Baptist, Hermits of. See HERMITS.

JOHN, Saint, an apostle and evangelist, was the son of Zebedee, a fisherman, of the town of Bethsaida, on the sea of Galilee, the younger brother of James the elder, (see JAMES,) and commonly reckoned the youngest of all Christ's disciples. His mother's name was Salome. Zebedee, though a fisherman, was not poor, and therefore we have no reason to imagine that his children were altogether illiterate, which some have imagined to have been the case, from a misinterpretation of Acts, iv. 13, in which the terms *μαθηται* and *διδασκαλοι* denote persons that were neither doctors nor magistrates, but men of private stations, who had not been educated in the schools of the Rabbies. (Grot. in loc.) See IDIOT. They were, without doubt, well acquainted with the scriptures of the Old Testament; having not only read them, but having heard them publicly read and explained in the synagogues. In common with other Jews, they entertained the expectation of the Messiah, and had heard John the Baptist preach, though they were not enlisted in the number of his disciples. Before John was called to be an apostle, it cannot be questioned that he had seen and heard our blessed Lord, and had been witness of some of his miracles, particularly that at the wedding of Cana in Galilee. (See John, ii. 1-11.) His call to attend upon Jesus steadily is related Matt. iv. 21, 22. Mark, i. 19, 20. Luke, v. 1-10. From this time he and his brother James were the constant attendants on Christ; they heard his discourses, and saw his miracles; and after previous instruction, both public and private, they were honoured with a selection and appointment to be of the number of the twelve apostles. What was his age at this time, his history does not precisely ascertain. Some have supposed that he was then 22 years old: others conjecture that he was about 25 or 26; and others again think, that he was about the same age with our Saviour. Dr. Lardner is of opinion, that none of the apostles of Christ were much under the age of 30, when they were appointed to this important office. However it be, John seems to have been the youngest of the twelve, and to have been distinguished by a temper singularly mild, amiable, and affectionate. He was eminently the object of our Lord's regard and confidence, and admitted, on various occasions, to free and intimate intercourse with him; so that he was characterized as "the disciple whom Jesus loved." The evangelical history recites many instances which evince the intimacy that subsisted between him and his master, and the high opinion which our blessed Lord entertained of his disposition and character. His failings, however, did not escape notice; and he was reprehended for them by our Lord. Notwithstanding his affectionate attachment to Christ, and the numerous instances of kind and condescending attention with which he had been honoured, he, in common with the other apostles, betrayed a culpable timidity in forsaking him during his last conflict; though he afterwards recovered his firmness, and attended the crucifixion: and, indeed, he seems to have been the only apostle who thus hazarded

zarded his own safety. On this occasion he was distinguished by the notice of his master, and by the recommendation of his mother to the future protection of this apostle. He was also a witness of the circumstances that ascertained our Lord's death and burial. After his resurrection John was the first who entertained the belief that he was really risen from the dead. On subsequent occasions, when Jesus manifested himself to his disciples, and thus evinced the reality of his resurrection, John was one of the number. In one of these interviews, when Peter, having received information of the manner of his own death, inquired with a reprehensible curiosity concerning the fate of John, our Lord replied, "what if he tarry till I come," thus intimating either that he would survive the destruction of Jerusalem, or that his life would be prolonged till it was terminated in the course of nature. After the ascension of Christ, and the effusion of the Spirit on the day of pentecost, John became one of the chief apostles of the circumcision, and exercised his ministry at and about Jerusalem, in the manner and with the success related in the book of Acts: he was present at the council of this city held in the year 49 or 50. (See Acts, xv.) Until this time he probably remained in the land of Israel, and had not travelled into any foreign countries. During his stay in Judea, it appears that he wrought many miracles. From the book of Revelation (chap. i. 9.) we learn, that St. John was for some time in the island of Patmos, where he was favoured with visions and revelations. He is supposed to have been banished thither in the 14th year of Domitian, and to have returned in the beginning of the reign of Nerva; so that his exile could not have lasted more than two years, or perhaps not above a year. From ecclesiastical history we learn that he lived to a great age, and that in the latter part of his life he resided in Asia, particularly at Ephesus, the chief city of that country. His settlement in Asia seems, from several circumstances, to have taken place about the time when the war broke out in Judea, in the year 66, or a short time before, when probably St. Peter and Paul had been previously crowned with martyrdom. According to Irenæus, this apostle lived in Asia till the time of Trajan, who succeeded Nerva, A.D. 98. From other accounts it appears that he died at Ephesus, and was buried near that city, about 68 years after our Lord's passion. Supposing our Lord to have been crucified in the year 32 of the vulgar era, which seems to have been Jerom's opinion; 68 years will extend to the year 100, or the third of Trajan; at which year of that emperor the death of St. John is placed by Jerom in his chronicle. At the time of his death it is not incredible, nor unlikely, that he was about 100 years of age. Some other particulars have been recorded concerning this apostle, which the most impartial critics have reckoned fabulous. It is related of him, that going to bathe at Ephesus, and perceiving that Cerinthus, or, as others say, Ebion, was in the bath, he came out hastily without bathing, saying to those that were with him, "Let us flee hence, lest the bath should fall while Cerinthus the enemy of the truth is within." It is also said, that by order of the emperor Domitian, St. John was cast into a cauldron of boiling oil at Rome, and came out again without being hurt. The following account, given by Jerom, of St. John's method of preaching when he was far advanced in years, and not able to make a long discourse, is more worthy of credit. "The blessed apostle John, living at Ephesus to extreme old age, and being with difficulty carried to church in the arms of the disciples, and being unable to make a long discourse every time they assembled, was wont to say nothing but this: "Little children, love one

another." At length the disciples and brethren who attended, tired with hearing so often the same thing, said, "Sir, why do you always say this?" who then made this answer, worthy of himself: "Because," says he, "it is the Lord's command; and if that alone be done, it is sufficient."

The writings which are generally ascribed to St. John, and received as his, are a gospel, three epistles, and the book of Revelation.

The gospel of St. John has been universally received as genuine; and, as it is generally allowed that he had seen the other three gospels, it may be considered as a kind of supplement to these, containing several things that occur in them, and many others which they have omitted. In the account of our Saviour's persecution, death, and resurrection, all four gospels coincide in many particulars; though here St. John has various things peculiar to himself. In his gospel many things recorded by the other evangelists are omitted. He has given us no account of our Saviour's nativity, nor of his baptism by John. He takes no notice of our Saviour's temptation in the wilderness; nor of the call, or names of the 12 apostles; nor of their mission in the time of our Saviour's life; nor of our Lord's parables, or other discourses of his, recorded by them; nor of our Saviour's journeys, of which they give an account; nor of any of those predictions relating to the desolations of Jerusalem, which are found in the gospels of Matthew, Mark, and Luke; nor has he repeated any miracles recorded by them, excepting only that of the multiplication of small provision for feeding 5000, with the extraordinary circumstances of the return to Capernaum from the country, where that miracle had been wrought. But he mentions several incidents which the other evangelists have not noticed. St. John gives an account of our Lord's cleansing the temple, at his first passover, when he went to Jerusalem; but all the other evangelists give a like account of his cleansing the temple at the last passover. These two acts are, however, different. He gives an account of the acts of Christ before the imprisonment of John the Baptist; of the wedding at Cana; of Nicodemus; of the woman of Samaria; of the cure of the man blind from his birth; of the resurrection of Lazarus; of the indignation of Judas at the woman who anointed the Lord with ointment; of the Greeks that came to Jesus; of Christ washing the feet of his disciples; and of the consolatory instructions, which he delivered to his apostles previously to his death, &c. St. John's gospel contains also more plain and frequent assurances than those that occur in the other gospels, that Jesus is not only a prophet and messenger of God, but the Christ, the Son of God, or that great prophet, that should come into the world; referring, as many suppose, by peculiar expressions, to his pre-existent dignity, though others think these expressions to be figurative.

Writers are not agreed as to the time when this gospel was written. St. John, according to Mill, Fabricius, and Le Clerc, wrote his gospel at Ephesus, after his return from the island of Patmos, A.D. 97, at the desire of the Christians of Asia. Wetstein thought that this gospel might be written about the year 32 after our Lord's ascension. Bafnage and Lampe supposed that it was written before the destruction of Jerusalem: Dr. Lardner adopts this opinion, and assigns the date of it to the year of Christ 68. This period brings it nearer to that of the three other gospels, which was about the year 64 or 65, and the gospel itself, the leading design of which was to shew how inexcusable the Jews were in not receiving Jesus as the Christ, and to vindicate the providence of God in the calamities already befallen, or now coming upon them, was suitable to the circumstances of the Jews at this period. It is observed by Dr. Lardner, as an evidence

dence that it was one great design of St. John, in writing this gospel, to shew the unreasonableness and great guilt of the Jews in rejecting Jesus, that in his gospel are inserted more instances of their attempts upon our Lord's life than in the other gospels. Chrysostom was of opinion, that St. John did not write his gospel till after the destruction of Jerusalem. John, he says, writes not any of the things that occur in Matt. xxiv., lest it should be thought that he took an advantage from the event: for he was living a good while after the destruction of Jerusalem. But the other evangelists, who died before the destruction of Jerusalem, and saw none of these things, record these predictions. But John, if he wrote at the time above specified, *viz.* when the event was near, might omit these predictions, as they were sufficiently recorded already, and as it is not his manner to repeat what had been related before. He gives, however, several intimations of the miseries that were coming upon the Jewish people. (Ch. iii. 36. iii. 18, 19. viii. 12. 21. 24. ix. 39—41. xii. 35, 36.) Mr. Whiston, observing that St. John uses the Roman or Julian beginning of the day in his gospel, and reckons the hours from midnight and noon, urges this as an argument for the gospel having been written after the destruction of Jerusalem, and the period of the Jewish polity, at Ephesus, a place remote from Judea, and under the Roman government. To this it is replied, that St. John does not compute the hours of the day after the Roman, but rather after the Jewish manner; and, supposing St. John to have used the Roman method of computation, it does not follow that he wrote after the destruction of Jerusalem, &c. As the gospel was written at Ephesus, at a distance from Judea, he might, if he thought fit, have used the Roman way of reckoning, especially when the period of the Jewish commonwealth was near, though not quite accomplished. The late date of the gospel has been also argued, from what some have alleged, to have been the object or end of the writer. Accordingly, many ancient and some modern writers say, that this gospel was written with a design to remove the errors of the Cerinthians, Ebionites, and other sects, which cannot be supposed to have appeared before the destruction of Jerusalem, and the overthrow of the Jewish people. But Mr. Lampe and Dr. Lardner have urged several reasons to shew that St. John did not write against Cerinthus, or any other heretics in his gospel; and that it was written before the rise of those heresies, which are said to be confuted by it. Lardner thinks that it would have been below an evangelist to write against heretics in the history of his Lord and master; and that none of the evangelists have entered into a particular account of things after our Lord's ascension. Nothing of this kind, says this writer, occurs in the rest of St. John's gospel; and, therefore, why should we imagine that there is any such thing in the introduction; the design of which is to shew, that Jesus came and acted by the authority of God, the Creator of the world, the God and supreme Lawgiver of the Jewish people. Some have thought, and particularly Grotius, that St. John concluded his gospel with the words, which are at the end of the 20th chapter; and that which is in the 21st chapter was added after St. John's death by the church of Ephesus. But this opinion is contradicted by the general, or even universal, consent of manuscripts and versions: to which it may be added, that none of the ancient Christian writers ever made a question, whether this chapter was composed by St. John or another. Moreover, the style is St. John's. Lardner's Suppl. to the Credibility, or Works, vol. vi. chap. 9.

Besides the gospel, St. John wrote three epistles, which are generally received in these parts of the world. The

genuineness of the first epistle does not seem to have been ever questioned. It is referred to by Polycarp, and the martyrs of Lyons, and quoted by Papias. The first and second epistles are cited by Irenæus, and received by Clement of Alexandria. Origen mentions three epistles, though he says that the second and third were not allowed by all to be genuine. Dionysius of Alexandria receives the first epistle, calling it the "Catholic epistle," and he mentions the other two as ascribed to St. John. The first epistle was received by Cyprian, and probably the other two. The second epistle is quoted by Alexander, bishop of Alexandria. Eusebius says, "that besides the gospel, his first epistle is universally acknowledged by those of the present time, and by the ancients; but the other two are contradicted," *i. e.* doubted of by some. All the three epistles were received by Athanasius, by Cyril of Jerusalem, by the council of Laodicea, and by Epiphanius. All three were received by Jerom: and the two last were doubted of by some in his time. All three were received by Rufinus, by the third council of Carthage, by Augustine, and by all those authors who received the same canon of the New Testament with our's. All three are in the Alexandrian MS. and also in the catalogues of Gregory Nazianzen and of Amphilochius. The Syrian churches, however, received only one; nor were any more received by Chrysostom. Upon the whole we may observe, that one epistle was received by all as certainly genuine; and it is not of any importance to contend about the other two, as they are so very short, and resemble the first in sentiment, phrase, and manner of writing. The second epistle consists of only thirteen of our verses; and of these eight may be found in the first, either in sense or expression. See CANON.

As to the time when these epistles were written, critics and commentators have entertained different opinions. Grotius, Hammond, and Whitby, suppose the first to have been written before the destruction of Jerusalem, and the former thinks the place of writing it was Patmos. Dr. Benson inclines to date it in the year of our Lord 68. Mill and Le Clerc refer it to the year 91 or 92; Bafnage to the year 98, and Baronius to 99. Beaufobre and Lenfant refer it to the end of the first century, when the apostle was far advanced in age. Whiston thought that this, and the two other epistles of St. John, were written not long after each other, about the year of Christ 82 or 83. Lampe supposes the first epistle to have been written after the Jewish war, before St. John's exile in Patmos, and, probably, some considerable time before it: so that he nearly agrees about the time of the epistle with Whiston. Dr. Lardner, considering that there are no expressions in the epistle declaring the time of it, or clearly referring to the calamities attending the downfall of the Jewish state, thinks it probable, that it was not written till a good while after that event, about the year of Christ 80, or later. Some have thought that the first epistle was written to Jewish believers in Parthia; and others are of opinion, that it was addressed to the Jewish Christians in Judea and Galilee. Others think it more probable, that it was directed to all believers, Gentiles as well as Jews; though Jewish believers are especially regarded. The second epistle is inscribed "The elder to the elect lady, and her children." By the "elect lady" some have understood the Christian church in general, and others understand the appellation as designed to express some particular church. Others again have supposed, that it was addressed to a female of the name of "Electa," or "Ecclesia;" and some have rendered the inscription "to the elect Kyria." Others again understand the inscription agreeably to our own translation; and this has been the common

common opinion, supported by the authorities of Beza, Mill, Wolfius, Wall, Le Clerc, and others.

The third epistle of St. John is inscribed, "The elder to the beloved Gaius." There were two persons of this name, mentioned in the Acts (xix. 29.), and in St. Paul's epistles (1 Cor. i. 14. Rom. xvi. 23.) He seems to have been an eminent Christian, who lived in some city of Asia, not far from Ephesus, where St. John chiefly resided, after his leaving Judea. Concerning the case to which St. John refers in this epistle, there have been various sentiments of learned men. Grotius supposed that the strangers here spoken of were believing Jews, whom Diotrephes, a gentle, and bishop of Pergamos, would not receive, because they were Jews, or because they were for blending the rites of the law with Christianity. Others think, that Diotrephes was a Jew, and zealous for the law, and that he would not admit these strangers, converts from among the Gentiles, because they did not consent to the observance of the rites and ceremonies of the law of Moses. Learned men have lately been of opinion that St. John here speaks of some, particularly Jews, who had gone out into the world, to propagate the Christian religion, without receiving any pecuniary recompence from those whom they had converted to the Christian faith: and they think, that Caius or Gaius is commended by St. John for encouraging such teachers, whilst he blamed Diotrephes for not receiving and helping them. But this opinion is rejected by Lardner as unfounded, and he sees nothing that should lead us to think preachers here spoken of, but only strangers in want. Some have supposed, that Diotrephes excommunicated, or cast out of the church, the "brethren," members of it, who were for receiving these strangers. Others suppose that the persons, whom Diotrephes cast out of the church were these strangers, not members of the church. It is supposed, that Diotrephes had the disposal of the revenues of the church; and that he opposed the distribution of the common stock to these strangers, partly Jews and partly Gentiles, who needed relief, and discouraged such as were willing to assist them out of their own property. Concerning the time of writing these two epistles, nothing can be said with certainty. Mill places them about the same time with the first, in 91 or 92. Whiston supposes, that all three were written about the year 82 or 83. Dr. Lardner conceives, that St. John was somewhat advanced in age, and that he had resided a good while in Asia, before he wrote any of these epistles. Hence he concludes, that these two were not written sooner than the first; and if the first was written about the year 80, these two may be reckoned to have been written between the years 80 and 90. See EPISTLE. Lardner's Works, vol. vi. chap. 20.

The book of Revelation has been also ascribed to St. John. See REVELATION.

JOHN, *St.*, *Christians of.* See CHRISTIANS.

JOHN, surnamed *Mark.* See MARK.

JOHN I. emperor of the East, surnamed *Zimisces*, was an Armenian noble, who served with distinction in the armies of Romanus the younger. After the death of that emperor, he assisted Nicephorus Phocas in his elevation to the empire and his marriage of the imperial widow, Theophano. Zimisces became an object of suspicion to Nicephorus, who deprived him of the post of general of the East, in which he had been generally victorious, and banished him from court. The hero was resolved to be revenged for the indignities inflicted on him, and having insinuated himself into the good graces of the empress, he contrived a plot to take away her husband's life. The plan succeeded, Nicephorus was slain,

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and John was immediately declared emperor, A.D. 969. Before the patriarch would consecrate him he was told he must, by public penance, expiate the crime of which he had been guilty. John threw the blame of the deed on his companions, and readily agreed to separate himself from them. Theophano parted in a paroxysm of rage, and was immediately shut up in a monastery of Armenia. The reign of John was chiefly spent in military transactions, in which his valour and good fortune were equally conspicuous. He obtained many victories over the Russians, Bulgarians, and Saracens; and is supposed to have fallen a sacrifice to the eunuch Basil, whom he had offended, after a reign of six years. John Zimisces, though arriving at the crown by an act of treason, wore it with glory, and seemed to merit it by his public and private virtues. His piety is extolled by writers of the time, and he is recorded as the first emperor who caused the effigy of Christ to be stamped upon the coin, with the legend, "Jesus Christ, the King of Kings."

JOHN II. emperor of the East, was born in 1088, and succeeded his father Alexius in 1118. Soon after his accession a conspiracy was excited against him by his sister, the celebrated Anna Comnena, to depose him in favour of her husband Bryennius. The conspiracy was discovered in time to prevent the evils that would otherwise have resulted from it. This was the only domestic trouble by which his reign was disturbed, and he had the happiness of being able, during an administration of twenty-five years, to banish capital punishments from the whole empire, not excepting the case of those persons who had engaged with his sister to take away his life. Against the public enemies of his country he was active and successful, and he entertained the ambitious project of extending the eastern empire to its former limits, and recovering Antioch from the dominion of the Latins. He not only planned the enterprize but actually set out on the business, accompanied by his two sons. These were carried off by a premature death, and he himself died shortly after, in 1143, of a wound from one of his own poisoned arrows. He was called the "Handsome," an appellation which has been thought to have been applied ironically: but whatever the qualities of his body were, his soul was formed in the mould of moral beauty, and few possessors of a throne have graced it with purer manners and more humane principles.

JOHN III., DUCAS, surnamed *Vataces*, emperor of the East, was born in 1193, and succeeded, by virtue of his marriage with the daughter of Theodore Lascaris, to the throne at the death of that prince. Constantinople, the capital of the empire, was, at this period, in the hands of the Latins, as was likewise a considerable part of the empire. John, however, was a prince of great virtue, and recovered all the other places which had been taken by the Latins, and reduced under his dominion the European territories almost to the gates of Constantinople, and nearly the whole of Lesser Asia. He fought and gained many battles, defeating the Scythians, Tartars, and Bulgarians, and extended his empire on all sides. While he was thus distinguished in war, he was equally illustrious in the internal administration of his affairs, by which he restored prosperity to the harassed subjects of the eastern empire. He encouraged agriculture, and the useful arts, and promoted simplicity and regularity of manners. He died in 1258, after a glorious reign of 33 years.

JOHN IV., LASCARIS, son of Theodore the younger, whom he succeeded in 1259, at the age of six years, but ere he had sat on the throne a single year, he was deprived of his eyes, and imprisoned for life, by the despot Michael Palaeologus.

JOHN V., CANTACUZENUS, emperor of the East, descended from the Paladins of France, was one of the principal confidants of the younger Andronicus, at the time of his revolt from his grandfather, and acted with great fidelity in the service of the young prince, in whose reign he held the office of great domestic, by virtue of which he ruled both the emperor and the empire. At the death of Andronicus in 1341, Cantacuzenus was left guardian to the eldest of his sons, then but nine years of age, and was made regent of the empire. His administration was disturbed by the ambition of the great duke Apocaucus, who encouraged the empress dowager to assert a maternal right to the tutelage of her son, and by the patriarch John, who laid claim himself to the office of guardian. In self-defence, therefore, Cantacuzenus caused himself to be made emperor in 1342, which produced a civil war, in which he was, at first, so far unsuccessful, that he was obliged to quit his country and take refuge in Servia. After a series of misfortunes he was at length, in 1347, received as a conqueror into Constantinople. He now associated himself with his ward in the empire, but the union was soon interrupted by intestine divisions, which, in 1355, he put an end to by a voluntary abdication, when he took the religious habit in a monastery of mount Athos. Here he employed himself in composing a history of the transactions to which he had been witness; and this work, comprising a period of forty years, from the revolt of the younger Andronicus to his own abdication, is one of the most elegant productions of the modern Greeks. He likewise engaged in a religious controversy, and composed four books against the Jews and Mahometans. This work was published at Basil in 1543; and of his History there is a Louvre edition in three volumes, fol. 1655. He is said to have died in 1411: a letter to him from pope Gregory XI., in 1375, is still extant. These are the only emperors of the name of John that require any notice in this work. Gibbon. Universal History.

JOHN, king of France, succeeded his father, Philip of Valois, in 1350, being, at the time, forty years of age. One of his first acts was to put to death, without the form of trial, the constable, count d'Eu, who was suspected of being in the interest of Edward III., king of England. This arbitrary act occasioned much discontent among his nobles, whom he attempted to appease by the institution of the order of the star, in imitation of Edward's order of the Garter, but being too lavish of the new honour, it was brought into contempt. A war broke out between England and France, and John summoned the states-general for the purpose of raising the necessary supplies. In the assembly of these states it was agreed that no proposition should be admitted without the unanimous consent of the three orders, which gave to the third estate an authority and independence which assimilated them to the commons of England. John made considerable concessions, and was enabled thereby to raise a powerful army. It was in this contest that the king of France was opposed to the Black Prince of England: at Maupertuis, near Poitiers, they met; the former with an army of sixty thousand men, the latter could scarcely enumerate twelve thousand effective soldiers. Edward, feeling the disadvantageous ground on which he stood, offered to resign his prisoners, and the booty which he had already made, and to sign a truce for seven years, provided he might be permitted to return to his own country in security, but John, confident of success, required him to surrender himself a prisoner, with the principal officers of his army. This demand brought on the famous battle of Poitiers, on the 19th of September, 1356, in

which John was made prisoner, and many of the French nobility lost their lives. The captive monarch, though respectfully treated, was brought to England to grace the triumph of the conqueror; the peace, in 1360, put an end to his captivity, but to obtain his liberty he made over many of the most valuable provinces of his kingdom to the king of England, and agreed to pay a ransom of three millions of gold crowns. The disasters to which he had already been subject, had so little effect in teaching him political wisdom, that at the persuasion of pope Urban V. he took the cross, and seriously resolved upon an expedition into the Holy Land. The execution of this project was prevented by the dishonourable escape of his son Lewis, count of Anjou, from England, where he was detained as a hostage. The king's sense of justice and honour determined him instantly to return to England in the stead of his son. He landed in 1364, and was received by Edward with great magnificence; but he was shortly after attacked with a disease, of which he died at the palace at the Savoy in April, in the 56th year of his age, and the 14th of his reign. John was possessed of many noble qualities, but he was not gifted with very superior talents: he was author of the maxim, "That if justice and good faith were banished from the rest of the world, they ought to find refuge in the hearts of princes." Univ. Hist. Hume.

JOHN, king of England, born in 1166, was the youngest son of Henry II. by queen Eleanor of Guienne. He was his father's favourite, nevertheless he joined his brother Richard in those projects against Henry, which induced the unhappy king, on his death-bed, to pronounce a curse upon his children. He was left without any particular provision, which circumstance gave him the name of "Lack-land." Richard, upon his accession to the throne, behaved with the utmost liberality to John, but his generosity could not attach him to his interest. During his absence in the Holy Land, he formed secret intrigues with Richard's rival and inveterate foe, Philip king of France. These broke out into open rebellion, but being unsuccessful, he threw himself upon his brother's mercy. With a knowledge of his character, Richard said to his intercessor, queen Eleanor, "I forgive him, and hope I shall as easily forget his ingratitude and injuries, as he will my pardon." John, who was utterly void of all sense of honour and generosity, proved the baseness of his nature by the act with which he purchased forgiveness. He invited the officers of Philip's garrison of Evreux to an entertainment, caused them to be all massacred, put the soldiers to the sword, and delivered up the town to his brother. He ascended the throne at the death of Richard in 1199, but he did not obtain an undisputed succession. War was excited in favour of Arthur of Brittany, in which the young prince fell into the hands of his uncle John: he was at first confined in the castle of Falaise, and his uncle in vain endeavoured to procure his assassination. At length he was conducted to the castle of Rouen, where John resided, and he was never after heard of. The manner of his death was uncertain, but it is generally believed that the king stabbed him with his own hands. From this period John became the object of universal detestation, and all his foreign subjects prepared to throw off the yoke. The pope also excommunicated him, and absolved his subjects from their allegiance. He for some time resisted the papal authority, but in 1213 he made his submission. The pope, now regarding England as his own, and jealous of the aggrandizement of Philip of France, sent a message to that prince, acquainting him with John's return to his duty towards the church, and requiring him to desist from hostilities against a country now under the protection

protection of the holy see. Philip had, however, made preparations for war, and was not to be put off from his plans by the mere order of the holy pontiff. A battle ensued, in which the fleet of England triumphed over that of France, and John even thought of regaining his former possessions; but the attempt was unsuccessful, and he was obliged to return in disgrace. His own barons, who had suffered by his controul, determined now to assert their privileges, and laid a statement of their grievances before the king, which he attempted to elude. To second their efforts they chose a general, and immediately proceeded to warlike operations. They were received into London with open arms, which so intimidated the king, that he was obliged to submit to such articles of agreement as they thought fit to dictate. At Runnymede, John signed the famous Magna Charta, the basis of English liberty, which not only protected the nobles against the crown, but secured many important rights and privileges to every order of freemen. It was stipulated that London should remain in the hands of the barons, and the Tower in the custody of the primate, till the articles of the charter were executed. The king made another attempt to retrieve his affairs by insisting under his banners foreign troops, but most of his projects failed, and he died partly of disease, and partly of chagrin, at Newark, in October 1216. The character of this prince is transmitted to us in very black colours: perhaps his vices have been exaggerated. Ingratitude, perfidy, and cruelty were certainly the ruling principles of his conduct. His private life was stained with licentiousness, and he seems to have paid no regard to the forms of religion. The best part of his conduct as a sovereign, was the attention which he paid to commerce and maritime affairs. In his reign London received the gift of its popular constitution of the corporation. Hume. Henry.

JOHN I., king of Portugal, natural son of Peter the Severe, was born about the year 1350, and raised to the throne in 1383, to the prejudice of John of Castile, who claimed in right of his wife Beatrix, daughter of Ferdinand. Soon after his accession, the king of Castile invaded Portugal with a powerful army, but victory, which decided in favour of John, permanently fixed him on the throne. In 1387 he married Philippa, daughter of John of Gaunt, duke of Lancaster. It was not till the year 1400, that a peace was finally settled between the two countries, which remained inviolate during the rest of the reign. John employed the season of public tranquillity in improving the police, and promoting the prosperity of his kingdom. Mindful of his former condition, he behaved with great condescension and familiarity to his subjects, and bestowed his favours liberally. Though his bounty kept him poor, he moderated his imposts, and found resources in his frugality with respect to the ordinary amusements of a court. He was accustomed to say that conversation was the cheapest of all pleasures, as well as the most improving, and he promoted a taste for letters among the nobility. He was, however, inflexible in the punishment of crimes, and by his severity in this respect, he rooted out the bands of braves kept by the nobility to execute private revenge. In 1414, he fitted out a formidable expedition against the Moors, in which he was successful, and he entrusted to his son Henry, duke of Viseo, the chief management of affairs in Africa, which gave occasion to that course of maritime discovery by which he became so much distinguished. (See HENRY.) The concluding cares of this sovereign were occupied in the settlement of his family, in which he was very successful. He died in 1433, after a long and prosperous reign, leaving behind him the character of one of the ablest and best of the Portu-

guese sovereigns, under the title of "the father of his country." He is regarded as the founder of a new royal family.

JOHN II., king of Portugal, son of Alphonso V. was born in the year 1455. In 1476, he was appointed regent, and, in 1481, he assumed the whole power of king on the death of his father. Finding that the administration of justice was become exceedingly corrupt, he appointed a commission to enquire into abuses, and to reform whatever was wrong. He watched over the conduct of the judges, forewarning them of his displeasure if they proved backward in the equitable discharge of their duties. "Take care," said he, to one of them, "I hear you keep your hands open and your doors shut:" this timely warning sufficed for his reformation. A conspiracy was shortly formed against his life, at the head of which was the duke of Viseo, a very young man and the queen's brother. The king, on being informed of it, sent for the duke to court, and taking him aside, charged him with his treasonable purpose. What particularly passed on this occasion is not known, but the result was, that the king drew his dagger, and laid the duke dead at his feet. Several of the other conspirators were apprehended, some were executed, and others went into voluntary exile. John, willing to shew that he was not unnecessarily severe, restored the forfeited estates of the duke of Viseo to his brother, whom he likewise raised to high dignity in the state. It is to the honour of this prince that he was the patron of commerce, particularly of that opened to the Portuguese by their settlements on the coast of Guinea. Being told by Cano, the discoverer of Congo, that the natives concealed their gold-mines, "Never look for them," said the king, "carry them what they want, and you will get their gold without digging for it." He did much towards the discovery of the passage by the Cape of Good Hope; but he had the mortification of reflecting, that by his refusal of the proposals of Columbus, he missed the opportunity of adding the western world to his dominions. About the year 1490, he was grievously affected by the death of his only son, who was killed by a fall from his horse at a race. He endeavoured, after this, to introduce his natural son George into the succession, but the great opposition which he met with in this scheme induced him to lay aside the project. He died in October 1495. The chief object of his reign seems to have been, to depress the nobility, to raise the inferior orders, and to promote the commercial prosperity of his kingdom.

JOHN III., king of Portugal, was born in 1502, and succeeded to the crown in 1521. The events of this reign are in many respects important, and attach to them very serious consequences. In the time of this prince the execrable inquisition was introduced into Portugal, of which it was the curse nearly three hundred years, and has only been abolished within these few months, at the suggestion or demand of the British court. John sent missionaries into the East Indies, of whom the celebrated Xavier was one. The new settlement of Brazil was brought into a flourishing state in this reign, and particular attention was paid to the conversion of the natives. The king was attentive to what he believed would conduce to the happiness of his subjects; he was economical with regard to himself, and unwilling to burden his subjects with new taxes. From his own resources he founded hospitals, constructed fortifications, highways, and aqueducts, restored the university of Coimbra, and executed other projects of utility and splendour. John died of an apoplexy in 1557, at the age of fifty-five, after a reign of thirty-five years. He was succeeded by his grandson Sebastian, a minor.

JOHN IV., king of Portugal, born in March 1604, was son of Theodosius, duke of Braganza, of the royal line. He succeeded his father in that dukedom in 1630, for, at that time, the Spaniards had taken possession of the Portuguese government, and annexed the country to the crown of Spain. It was become, in the reign of Philip IV., a domain of Castile, intended for the enriching of favourites. The oppressions and indignities suffered by the Portuguese had inflamed their discontents to the highest pitch, and they were only waiting for a leader, to break forth into a general revolt which they meditated. They fixed on the duke of Braganza, and offered him the crown of Portugal, if he would stand forth in their cause, and merit the high honour by his prowess. The Spanish court, aware of their intentions, practised a variety of arts to get the duke into its power. The highest honours were offered him, in hopes of alienating him from the Portuguese cause; when these proved ineffectual, he was invited, or rather ordered, to come to Madrid to confer on state affairs, and the impossibility of excusing himself from this step, hastened his final determination. The leaders of the conspiracy pressed him again to accept of the crown; he hesitated, but on consulting the duchess, she confirmed him, with this heroic address, "My lord, a violent death awaits you with certainty at Madrid, perhaps at Lisbon; at the former place you must die as a wretched prisoner; here, covered with glory, and a king. Let us confide in the love of the people, your just claim, and the protection of heaven." He accordingly acquiesced, a revolution was effected in his favour in December 1640, and he was instantly proclaimed John IV. The new sovereignty was acknowledged by all the powers of Europe, not immediately under the influence of the house of Austria, a conspiracy was however formed against his life and throne, but it was discovered and suppressed, and a treaty with France and the United Provinces assisted Portugal in foiling the attempts of Spain to recover its sovereignty. The reign, nevertheless, was passed in perpetual hostilities, though carried on with little vigour on either side. John died in 1656, leaving behind him two sons and two daughters. His reign, though far from brilliant, was useful; he was ever desirous of promoting the good of his people, and very unwillingly imposed any burthens on them. He recovered from the Dutch, and secured the valuable settlement of the Brazils, but lost the island of Ceylon.

JOHN V., king of Portugal, born in 1689, succeeded his father Peter II., in December 1706. The nation was at this time engaged in the Spanish succession war, as one of the allies against the house of Bourbon; the new king was faithful to the cause, but little either of success or honour attended his arms. The peace of Utrecht was favourable to Portugal, and from that time the king's attention was occupied in rendering his country flourishing. His government was wise and moderate, his character generous and patriotic. He died in 1750. For farther particulars relating to the kings of Portugal, the reader is referred to the *Modern Universal History*.

JOHN, king of Denmark, born in 1455, succeeded his father Christiern I. in 1481. He had been acknowledged king of Denmark and Norway in his father's life-time. He expected to have been chosen king of Sweden, but was disappointed by the intrigues of the administrator of that kingdom, and it was not till 1497 that he was crowned the king. At the coronation-feast, one of the king's German officers hinting that it would be a politic act to cut off the heads of those who had been leaders in the opposition to him, John replied with a manly indignation, that he would rather see all his evil counsellors on a gibbet

than incur the shame and infamy of so savage a deed. "God forbid," said the virtuous monarch, "that I should ever deny to any free people the right of choosing their own governors." For some time he acted conformably to this sentiment, and exhibited a mind intent upon the public good, which produced a general satisfaction with his government. John, however, did not always act upon the principle of equity, which the maxim above quoted should have inculcated. The people of Dithmarsh accordingly vindicated, at the point of the sword, their independence; and their success was the forerunner of an open revolt in Sweden, where discontents had been gradually accumulating against the king's administration, owing to the facility with which he had conferred offices and grants on his favourites, to the prejudice of the natives. The former regent headed the malcontents, and renounced his allegiance to John. The queen, Christina, who was left at Stockholm, was obliged to capitulate; and a revolution was effected in 1502. After this many changes in the government took place, several of which led John to hope for a restoration to the crown; and a treaty for that purpose was concluded a short time before his death, which happened in February 1513, in consequence of a fall from his horse. He possessed many estimable qualities, and would have been a really good king, but that he suffered himself to be swayed too much by his favourites.

JOHN III. king of Sweden, born in 1537, was second son of Gustavus Vasa, who settled upon him the dukedom of Finland. In 1560 he was sent to the court of England to forward the proposed union between his elder brother Eric and queen Elizabeth. Not long after this Eric succeeded to the crown, and John became the object of his suspicion. He was arrested, brought to trial, and condemned; but his life was spared, and the sentence exchanged for perpetual imprisonment. Several times it was determined to destroy him, but the tyrant as often relented, till at length, finding it necessary to strengthen his government, he liberated John in 1567, to the great joy of the Swedish nation. In the following year he took up arms against Eric, whom he deposed, and ascended the throne in his stead. He found the nation involved in a war with Denmark and Russia, and almost struggling for its existence. He concluded peace with the former power, but hostilities continued with the latter till they were suspended by a truce in 1573. By the influence of the queen, John abjured the Protestant religion, and embraced that of the church of Rome. In consequence of this dereliction of principle he made many enemies; and although numbers of the clergy were gained over by views of ambition and emolument, yet a formidable party, attached to the reformation, with the king's brother, Charles, duke of Sudermania, at their head, made such an opposition as nearly to involve the kingdom in a civil war. By the death of the queen, John found it expedient to lessen his zeal with regard to the establishment of the Roman religion, though he retained the desire of making it the religion of the state. He accordingly published a liturgy conformable to it, the use of which he enjoined to the clergy under the severest penalties. The flame of religious discord was hereby re-kindled; and the duke Charles again stood forth as the defender of the Protestant church. In 1590 John married Christina, daughter of the duke of Holstein. The war with Russia was renewed, and Sweden lost several fortresses. In this state of affairs John died in 1592, after a reign of 24 years. *Mod. Univ. Hist.*

JOHN SOBIESKY, king of Poland, born in 1624, was son of a brave and able statesman of the same name. He received

ceived a very liberal education, and visited the politeſt courts in Europe. He aſcended, through the ſeveral gradations, to the higheſt poſt in the army, and ſignalized himſelf in many important actions. In the battle of Choezim, in 1673, after three days fighting, he gave the Turks a total and bloody defeat. In the following year, after many difficulties, and ſtruggling through much oppoſition, he ſucceeded to the crown of Poland, and immediately applied his reſources in the proſecution of the Turkiſh war, and by a ſeries of brilliant ſucceſſes ſoon induced the Porte to agree to a treaty, which completely revoked the diſhonourable terms of a former one. His coronation followed the reſtoration of peace, and he employed the interval of tranquillity in the re-eſtabliſhment of the finances of the kingdom, and in preparations for a future war, which his own martial diſpoſition rendered no diſtant event. In 1683, he made an alliance, offenſive and deſenſive, with the court of Vienna, and without hesitation expended the treaſures which he had accumulated in levying troops, and putting his army into the beſt poſſible ſtate. The Turks having laid ſiege to Vienna, and reduced it to great ſtraits, he marched to its relief. Forming a junction with the imperial general, the duke of Lorraine, they attacked the Turkiſh camp on September 11th, 1683, entirely routed the Grand Viſir, took poſſeſſion of all his cannon, warlike ſtores, &c. and broke up the ſiege. The people of Vienna regarded John as their ſaviour, and all Europe has rendered him the homage due to his heroism on this important occaſion; but the pride of the emperor Leopold produced from him a cold and ungracious acknowledgment of the ſervice. Between this and the year 1686 he performed many other noble deeds of valour; but from that period he paſſed life without glory, in projects for the advancement of his family by alliances, and eſpecially for ſecuring the crown to his ſon, by which he was involved in many domeſtic inquietudes, and civil diſſentions. He died in 1696, leſs regretted than might have been expected; but he had been accuſed, in his latter years, of conſulting the intereſts of his own power and ambition, rather than thoſe of his country. It was, however, univerſally admitted that he was not only a brave warrior and conſummate commander, but poſſeſſed all the accompliſhments that are fitted to adorn a throne. As a literary man, he was eloquent and well informed on moſt ſubjects. He was a good Latin ſcholar, converſant in ſeveral modern languages, and acquainted with ſcience beyond moſt of his countrymen. Mod. Univ. Hiſt.

JOHN of Gaunt, or Ghent, duke of Lancaſter, was the third ſon of Edward III. king of England, and born at Ghent in 1340. He married Conſtance, a natural daughter of Peter the Cruel, king of Caſtile and Leon; and on the death of that monarch he laid claim to the throne in right of his wife, in oppoſition to Henry of Tranſilamare, but without ſucceſs. He ſerved with conſiderable glory in France with his brother the Black Prince, and on his death the management of public affairs was committed to the care of John during the life of his father. On the acceſſion of Richard II. he retired; but the envy of the courtiers, particularly the eccleſiaſtics, who hated him for proteſting Wickliſſe, followed him with falſe accuſations of a deſign to uſurp the throne, from which, however, he ſatisfactorily vindicated himſelf. In 1386 his only daughter was married to the heir apparent of the king of Caſtile, and John renounced his claim to that crown in conſideration of a very large ſum of money and penſion. John took for his third wife Catherine Swinford, ſiſter to the wife of his friend Chaucer the poet. He died in 1399, leaving a high character for valour, prudence, and generoſity. His ſon afterwards

became king, under the title of Henry IV. See Hume's Hiſt. and Godwin's Life of Chaucer.

JOHN of Auſtria, Don, the natural ſon of the emperor Charles V. was born at Ratibon in 1547. He firſt appeared as a public character in 1569, during the revolt of the Moors of Granada, when he was appointed captain-general of the Spaniſh galleys, and was ſent to Carthageſa to take the command. He aſſiſted in the operations of the war, which was brought to a happy termination the following year. The holy league againſt the Turks for the protection of the Venetians, being formed between the king of Spain, the pope, and the Italian ſtates, don John was nominated, in 1571, general in chief, and aſſembled the united fleet at Cortu. In October he engaged with the Turkiſh fleet in the gulph of Lepanto, and obtained that victory which ſtands conſpicuous in the ſeries of actions between the Chriſtian and Mahometan powers. Don John, in perſon, fought with and took the Turkiſh admiral's galley, and the battle terminated in the loſs, on the part of the Turks, of 130 galleys taken, 55 deſtroyed, 25,000 men killed, and 10,000 made priſoners, beſides relieving the liberty of 15,000 Chriſtian ſlaves. Diviſions aroſe as to the future operations of the war: the advice of John was over-ruled, and the advantages obtained by this ſplendid victory by no means equalled the public expectation. In 1576 he was appointed governor of the Low Countries. The Catholic provinces had united with Holland and Zealand againſt the Spaniards, and don John was directed openly to concur in this convention, and cauſe the Spaniſh troops to leave the country. Shortly after this don John took poſſeſſion of Namur, Charlemont, and Marienburg, contrary to the intereſts of the ſtates, who, in 1577, refuſed their arms, depoſed don John, and declared the archduke Matthias their governor. A war commenced, and John gave the army of the Netherlands a very ſignal defeat, and made himſelf maſter of many ſtrong places. He was proceeding in his military career, when, in October 1578, he was taken off, after a ſhort illneſs, in his camp at Namur, in the 32d year of his age. He reſembled his father in perſon, whom he equalled in activity and enterpriſe, and whom he greatly ſurpaſſed in generoſity and humanity.

JOHN I. pope, was a native of Tufcany, and aſcended the papal chair on the death of Hormiſdas, in the year 523. His pontificate was ſhort and wretched, owing to the intemperate zeal of the emperor Juſtin for the extirpation of all the ſects who would not conform to the Catholic faith: he even attempted to extirpate the Arians, of which party Theodoric, king of the Goths, avowed himſelf a defender. This prince wrote to the emperor moſt preſſing letters in favour of his perſecuted ſubjects, and when he found that no regard was paid to theſe, knowing the influence which the pope had at the imperial court, he ordered John to attend him at Ravenna: from thence he went in quality of ambaffador to Conſtantinople, where he was very honourably received, but the main object of his embaſſy was conducted in a way which gave his employer very little ſatisfaction; and on his return Theodoric cauſed him to be conducted from the palace to a priſon. He died in confinement in the year 526, after a pontificate of little more than two years and a half.

JOHN II. was elevated to the papal throne in 533, upon the death of pope Boniface II. In the following year the diſpute, "whether one of the perſons of the Trinity ſuffered in the fleſh," was carried on with great bitterneſs. In this diſpute the emperor Juſtinian took a part; he not only maintained the affirmative ſide of the queſtion, but declared all thoſe who diſſented from him to be heretics. He alſo wrote

wrote to John, sending him his own creed, assuring him that it was the faith of the whole eastern church, and intreated him to pronounce a judgment in its favour. The emperor's letter was accompanied with rich presents, and the pope, without much hesitation, decided in favour of Justinian's confession. He died in 535, after a pontificate of two years and five months. Six letters bear his name in the Collect. Concil. of which the first is generally rejected as spurious.

JOHN III. pope, surnamed *Cataline*, a native of Rome, was son of Anastasius, a person of considerable distinction. He was elevated to the popedom on the death of Pelagius in 560, and after holding it about thirteen years he died.

JOHN IV. pope, surnamed *Scholasticus*, was elected to the pontifical dignity upon the death of pope Severinus, in the year 640. He engaged deeply in the controversy of the MONOTHELITES (which see), and involved himself in some difficulties on that account. He employed the wealth of the church in humanely redeeming vast numbers of Christians, whom the Sclavi had carried off captives in their irruptions into the empire during the reign of Heraclius. The reign of this pontiff did not extend to a single year. Three of his letters are inserted in the fifth volume of the Collect. Concil.

JOHN V. pope, a native of Antioch in Syria, was, while only a deacon in the church, appointed by pope Agatho one of three legates, whom he chose to be his representatives at the sixth general council, and it was by him that the Greek copy of the letters of Honorius to Sergius, produced and read in the council, was compared, and found entirely to agree with the Latin original, deposited in the library of the patriarch. In 685, upon the death of Benedict II., John was elected his successor, an honour which he retained something more than a year. He died, after a long and tedious illness, in the year 686.

JOHN VI. pope, was elected to the papal throne in the year 702: the reigning emperor, Tiberius Apfimar, objected to the election, and ordered him to be driven from the apostolic see: but the soldiers took part with John, and established him on his throne. He displayed great generosity by redeeming many captives, whom the duke of Benevento had taken in an irruption into the territories of the empire of Italy, and at length prevailed upon that prince to put an end to his hostilities against the subjects of the empire. He held a council at Rome, in which Wilfrid, who had been driven from the see of York, and banished England, was declared innocent of the crimes laid to his charge. John died in 705, after a reign of little more than three years.

JOHN VII. pope, was raised to the pontifical dignity on the death of John VI. Immediately on his elevation to the throne, the emperor Justinian demanded of him his opinion with regard to certain canons; but John was too wary to be thus drawn into a trap, and declined giving any judgment, lest, by so doing, he might incur the emperor's displeasure. He died after a pontificate of two years and seven months, in the year 707. A single letter of this pope is to be found in the sixth volume of the Collect. Concil.

JOHN VIII. pope, was, on the death of Adrian II., elected to fill the papal see. This was in the year 872; and in the following year the emperor Lewis II. came to Rome, where he held an assembly of the states of Italy subject to his empire, at which the pope assisted. In that assembly the pope absolved Lewis from an oath which he had taken not to interfere with the government of the dukedom of Benevento, under the pretence that it had been extorted by force, and also that it was inconsistent with the welfare of the empire. In 875 he crowned the emperor Charles the Bald, and three years after went to France, where he held a council at Troyes.

In his pontificate Italy was greatly ravaged by the Saracens, who obliged the pope to pay tribute. He corresponded with Photius, patriarch of Constantinople, who had driven Ignatius from his seat, and usurped for himself the dignity. At first the pope refused to acknowledge him; but Photius, by rich presents, rendered his holiness propitious, who not only consented to absolve him from the excommunications which had been repeatedly thundered out against him, but readily received him as his brother and colleague. In a council held at Constantinople, in the year 879, at which the papal legates and Photius conjointly presided, the latter was declared lawful patriarch of the imperial city, and the legates, won over by his presents, ventured so far to depart from their instructions, that they pronounced an anathema against all who should receive any of the councils which had condemned him. Upon their return to Rome, conscious of having gone beyond their instructions, they endeavoured to conceal this circumstance from the pope; but he was soon apprised of it, and exasperated, as well at their treachery, as at the dissimulation of Photius, declared all their proceedings null and void, and assembled another council in 881, at which he caused the patriarch to be a second time condemned. After this he made an offer of the imperial crown to Charles the Gros, and urged him by all means to come to Rome to receive it. As soon as the state of his affairs would permit him, Charles proceeded to that city, and was crowned by the pope in St. Peter's church. John, however, could not prevail with the new emperor to lend him any assistance against the Saracens; he, therefore, endeavoured to gain over such of the Italian princes as had entered into an alliance with them. He even went to Naples, to try whether he could persuade Athanasius to turn his arms against them. That prelate promised to support the pope, and was supplied with money to enable him to levy the requisite forces, but with the coolest treachery he turned those forces against the pope himself. John instantly excommunicated him, and refused him absolution but upon such conditions as he could not comply with. This pope died in the year 882, after a pontificate of little more than ten years. More than three hundred of his letters are to be found in the ninth volume of the Collect. Concil. some of which are said to throw considerable light on the ecclesiastical and civil affairs of the time in which he flourished. He left also a sermon pronounced in council on the confirmation of the election of Charles the Bald.

JOHN IX. pope, a native and deacon of Tivoli, was raised to the papal dignity on the death of Theodore II. in 898. At this period Italy was divided by the factions of different pretenders to the empire: John at first refused to take any part in these contests; but owing to the violence of Berenger, king of Lombardy, he was induced, apparently, to espouse his cause, and to crown him emperor. He had, however, no sooner left the city, than the pope assembled a council, in which he declared the coronation of Berenger null and void, as having been extorted by force, and acknowledged Lambert, who had also been crowned king of Italy, as the only lawful emperor. In the same year John convened a council to meet at Ravenna, which confirmed the acts of the council of Rome, and approved of the coronation of Lambert, who was present in person. This pope died in the year 900, after having filled the papal chair about two years. Four of his letters are extant in the ninth volume of the Collect. Concil.

JOHN X. pope, rose in the church by degrees, from the rank of deacon to that of archbishop of Ravenna. He was indebted, for this last promotion, to a celebrated prostitute Theodora, with whom he had long been intimate notwithstanding

standing his elevated station in the church. In 914, Theodora, by her intrigues and interest, got her favourite and friend preferred to the pontifical chair. Under this pope, Rome and Italy were indebted for deliverance from the barbarous and oppressive Saracens. In 916 he crowned anew Berenger, who readily assisted him in his ambitious projects. The pope resolved to take the field himself as generalissimo of all the forces, and under him the Saracen power was completely annihilated, which, during the space of forty years, had been the terror of the whole of Italy. In the following year the pope began to feel some compunctions of conscience on account of his former conduct, and accordingly sent a legate, as his proxy, on a pilgrimage to the tomb of St. James, of Compostella, in the kingdom of Leon, hoping, at least wishing, others to believe, that he should atone for his vices by offering rich presents at the shrine of a departed saint. In the year 925 John shewed how little regard he paid to the canons of the church by confirming the nomination of Hugh, a child only five years old, and son of count Herbert, in the archbishopric of Rheims. As John was indebted for his rank and elevation in the church to the intrigues of one infamous woman, so he lost his dignity and life through those of another. This was Marozia, the daughter of his former mistress Theodora. Marozia, exasperated that she did not succeed her mother in the confidence of the pope, resolved to destroy him and his brother Peter, who at this time was in habits of the strictest intimacy with him. She communicated the bloody design to her husband, and prevailed on him not only to approve, but to be the instrument of carrying it into execution. Accordingly this wretch, on a certain day, when the pope and his brother were together in the Lateran palace, broke into it at the head of a band of ruffians, killed Peter before his brother's face, and then, seizing the pope, dragged him to prison, where he soon afterwards died. This tragical event happened in the year 928, after John had been seated on the papal throne more than fourteen years. Three of the letters of this pope are to be found in the ninth volume of the Collect. Concl.

JOHN XI. pope, was supposed to be the natural son of pope Sergius III. by the infamous Marozia, but according to others he was the son of Alberic, duke of Spoletta. It is certain he attained the dignity of pope through the influence of Marozia, and her husband Guy, marquis of Tuscany, in the year 931, upon the death of Stephen VII. Guy did not long survive the promotion of John, and immediately upon his death, Marozia sent word to his brother Hugh, king of Lombardy, that she would make him master of Rome, upon the condition of marrying her. To this the prince readily acceded, and took possession of his bride, and the castle of St. Angelo at the same time. Hugh rendered himself hateful to the Romans, and excited the resentment of Alberic, a son of Marozia by her first husband, who put himself at the head of the discontented, attacked the castle of St. Angelo, and made himself master of the fortrefs. In the confusion Hugh made his escape, but Marozia and pope John fell into Alberic's hands, who kept them both in close confinement during the remainder of their lives. John died in 936, after a pontificate of nearly five years.

JOHN XII. pope, whose original name was Octavian, was son of the Alberic referred to in the last article. On the death of his father in 954, Octavian succeeded to his dignities, and not satisfied with his temporal power, he aspired to the papal throne when it became vacant in the year 956, and secured the possession of it to himself. On this

occasion he assumed the name of John XII. and thus introduced the custom which was afterwards adopted by his successors of changing their usual names for others, upon their accession to the pontificate. At this time Berenger tyrannized over Italy, and the pope implored the assistance of Otho I., who delivered the country. John crowned Otho at Rome, and promised him fidelity, which however was of very short duration, for he united with the son of Berenger against his deliverer. Otho returned to Rome in 963, and called a council, in which the pope was accused of adultery, sacrilege, and other crimes, which were satisfactorily proved against him, and he was deposed. When the sentence of his deposition had been pronounced, the council, clergy, nobility, and people, unanimously elected Leo VIII. to fill his place. After this, John several times conspired against the life of the new pope, and was as frequently pardoned, till at length he contrived to set himself again on the papal throne. John instantly assembled a council of prelates and cardinals, who condemned the council that had deposed him, and passed different sentences of condemnation on all those who had been accessory to the elevation of his rival. John did not long survive the holding of this council, for having engaged in a criminal connection with a married woman, the injured husband who caught him in the act put an end to his holiness's life and debaucheries by some violent blows which he gave him on his temples. His death is supposed to have taken place in 964, after he had filled the papal throne about eight years. A single letter of his is inserted in the ninth vol. of the Collect. Concl.

JOHN XIII. pope, was one of the principal accusers of the pope whose history has been just given. By the part which he took on this occasion, he recommended himself to the favour of the emperor Otho, who, after the death of John, returned with his army to Rome, and held a council there, in which a decree was passed, conferring on the emperor and his successors for ever the power of nominating the pope, and of granting investiture to bishops. After the death of Leo VIII., in the year 965, John was recommended by the emperor as his successor to the holy see, which was decidedly contrary to the inclination of the Roman people, who conspired against him and drove him from his throne. The emperor determined to take ample revenge for this insult, and marching his army, he restored the pope, and severely punished those who had taken part against him. He next went to Ravenna, accompanied by the pope, where he held a council in the year 967. Upon the breaking up of the council the pope returned to Rome, where he spent the remainder of his life in the unmolested possession of his high dignity. In 968 he crowned, in St. Peter's church, the young Otho, king of Germany, whom his father had taken for his partner in the empire, and in the year 971 he crowned as empress Theophania, daughter of the late eastern emperor Romanus, who was married to Otho the younger. John died at Rome in 972, after having presided in the Roman see nearly seven years. In his pontificate the Poles were first converted to the Christian religion, and he is said by some writers to have been the person who introduced the practice of blessing or consecrating church bells. Four letters of this pope may be found in the ninth vol. of the Collect. Concl.

JOHN XIV. pope, succeeded to the papal chair on the death of Benedict VII. in the year 985, an honour which he enjoyed but eight months. Boniface VII. who is classed among the anti-popes, undertook the expulsion of John. He prevailed, seized his rival, confined him in the castle of St. Angelo, and there either starved him to death, or

more

more humanely dispatched him with poison. Boniface himself did not long survive the victim of his cruelty, being carried off in the same year by a sudden death. Upon this event, John, a native of Rome, and the son of one Robert, was elected pope, and governed the church during the space of about four months, but for some cause or other, not sufficiently explained, he is not reckoned among the popes.

JOHN XV. was elected to the papal dignity in the year 985, on the death of John, the son of Robert, who has been just mentioned. Soon after the commencement of his pontificate, Crescentius, a man of great power at Rome, aspired at the sovereignty of the city, seized the castle of St. Angelo, and assumed the title of consul. The pope, conceiving that he was in danger, implored the assistance of the emperor Otho III., who promised him, that, if necessary, he would come with his whole army, and support the apostolic see with the same zeal which his father and grandfather had displayed. John informed Crescentius of the imperial determination; he submitted, and sent some of the chiefs of his party to invite his holiness back to Rome, with the strongest assurances of safety, and of that respect which was due to the successor of St. Peter. John complied, and was permitted to live unmolested till towards the close of his pontificate. In the year 993, at a council held at the Lateran palace, the pope, after hearing read an account of the life and supposed miracles of Ulderic, bishop of Augusta, declared, with the approbation of his bishops, that from thenceforth Ulderic might be worshipped and invoked as a saint in heaven reigning with Christ. This is the first instance on record of the solemn canonization of a pretendedly meritorious character, a practice which soon contributed to crowd the Roman calendar with saints, and loaded the church with wealth, by the rich offerings with which the superstitious multitude was encouraged to propitiate the favour of those new mediators between God and man. About this period the pope became engaged in a quarrel with the French clergy, over whom he obtained a complete victory; he had, however, more trouble with Crescentius who began to resume his ambitious projects at Rome. John applied again for assistance to Otho, who marched an army to his assistance, but in the midst of these warlike preparations the pope died in the year 996, and in the eleventh year of his pontificate. Three of his letters are extant in the ninth vol. of the Collect. Concil.

JOHN XVI. pope, was a native of Rossano, in Calabria, of mean extraction, but a person of considerable abilities and address. He was employed by the emperors Otho II. and III. in affairs of considerable moment; from the latter he obtained possession of the see of Placentia, and held it till he heard that Gregory V. was driven from Rome by Crescentius in the year 997, when he bargained for, and purchased the popedom of that usurper, and then assumed the title of John XVI. He was excommunicated by several councils held in Italy, France, and Germany, and at length the emperor Otho brought against him a powerful army. The pope, or, as he is sometimes called, the antipope, endeavoured to make his escape from the city, but falling into the hands of some of Gregory's friends, they barbarously deprived him of his sight, and cut off his nose and ears. To complete the climax of their cruelty, they mounted the unhappy wretch on an ass, led him through the streets of the city, and forced him to exclaim "Whoever shall dare to dispossess a pope, let him be served like me."

JOHN XVII. pope, was elected to the holy office on the death of Silvester II. in the year 1003, in which year he also died, after he had presided over the church about five months. It has been asserted, that from this time, the peo-

ple were deprived of voting at elections of the sovereign pontiffs, which was afterwards confined to the clergy. He was succeeded by

JOHN XVIII. pope, who held the office to which he was elected in 1003, between five and six years, but few of his acts have come down to us, except his sending St. Bruno to preach Christianity to the Russians, and his putting an end to the schism which existed between the eastern and western churches.

JOHN XIX. pope, was son of Gregory, count of Tusculum, and brother of Benedict VIII. Upon the death of the latter in the year 1024, the influence and wealth of Gregory procured the election of his other son, who was then a layman. It was at this moment that he thought it advisable to assume the name of John XIX. Early in this pontificate an attempt was made, by the emperor Basilus, to allow the patriarch of Constantinople the title of Universal bishop of the East, but John sent back the ambassadors with a refusal, telling them that the title of universal bishop became none but the successors of St. Peter in the apostolic see. In the year 1026, Conrad, king of Germany, having entered Italy with an army, and having reduced all the towns which had shaken off the imperial yoke, went to Rome, where the pope crowned him emperor, and his queen empress, with the usual solemnities. On this occasion, Rudolph, king of Burgundy, and Canute, king of England, who were on a pilgrimage to Rome, were present. John died in 1033. Three of his letters are inserted in the ninth volume of the Collect. Concil.

JOHN XX. or XXI. pope, a Portuguese, son of one Julian, a physician, became eminent for his acquaintance with the sciences, particularly with that of medicine, the practice of which he followed for some time with great reputation. He afterwards devoted himself to the church, and advanced by degrees to high preferment. He was made cardinal by Gregory X., and on the death of Adrian V., in 1276, he was elected to the pontifical dignity, when he took the name of John XX. or XXI. The first act of his pontificate was to revoke the famous constitution of Gregory X. which ordered that the cardinals should be shut up in the conclave during the vacancy of the papal see. He did all in his power to assist the Christians in the East. He was ignorant of the world, and became attached to the pretended principles of judicial astrology; from these he thought he had many years to live, and began to devise schemes for the future. He was, however, carried off in eight months after his elevation to the holy see. He was author of several tracts on logic, one on physiognomy, and some medical treatises. One of his letters to Edward I. king of England, is in the tenth volume of the Collect. Concil. and some others in the second volume of Widdings' "Annal. Minor."

JOHN XXI. or XXII. pope, a Frenchman by nation, and by descent, according to different writers, the son of a noble, a tavern-keeper, or a cobbler. In early life he was appointed to some considerable offices in the state, the duties of which he performed with so much credit to himself, as to manifest very superior talents for public business. On the death of Clement V., in 1314, the most violent disputes occurred in the election of a successor to the holy see. These were carried on for two years, after which the cardinals unanimously elected James de Ossa, the subject of this article, who assumed the name of John XXI. or XXII. During his pontificate he founded several abbeys and bishoprics; but he was not only the witness to, but the perpetrator of, many cruelties with respect to the Franciscans; some of whom were, by his order, actually staved alive, as preparatory to their being bound to the stake for burning, which savage

savage sentence was carried into execution without mercy. The cruelty of John was condemned by his warmest adherents, who did not scruple to declare that by it he had rendered himself utterly unworthy of the papal dignity, and that his deeds proved him to be the predicted anti-christ. They even revered these victims as martyrs to the truth, paying religious veneration to their bones and ashes. He was next involved in the dispute whether Christ and his apostles ever possessed any property or dominion, either in common or personally. The discussions on this question were violent and bitter, and those who maintained the negative side of the question paid for their temerity by the most excruciating sufferings inflicted on them. John was now engaged in a dispute with Lewis of Bavaria, who, as the reward of his victory over Frederic of Austria, claimed the Imperial crown as his right. John, alarmed at his assurance, instantly excommunicated him, and forbade all the subjects of the empire, on penalty of the same sentence, to acknowledge him for king, or obey him as such. From this sentence the monarch appealed to a general council, and published a manifesto against his holiness, describing him as one who trampled on all laws, human and divine, to gratify his ambition or avarice; as a ravenous wolf, fleecing and devouring the flock committed to his care; and, as an avowed heretic, in condemning as heresy the doctrine concerning the poverty of Christ. John died after a most turbulent pontificate, in the year 1334, at the great age of ninety years. Notwithstanding his various acts, which have been but merely referred to, he found biographers to praise his good deeds, forgetting those which were of a contrary description. They said he was a man of learning, and an encourager of the learned. The historian has held him up as ambitious, arrogant, cruel, and avaricious. He is supposed to have been the person who invented the "Annates," obliging every clergyman, preferred to a benefice, to pay into the apostolic chamber one year's income before he took possession of it. He died immensely rich, and was known in the literary world as author of several treatises: one "On the Contempt of the World;" one "On the Transmutation of Metals," and twenty-two Constitutions which he ordered to be called "Extravagantes." Many of his bulls and letters are likewise extant. He is said also to have been author of several treatises on medicine, which led some of his biographers to say he was better fitted for a physician than a pope. He is said by Walther to have written, among other things, a treatise on music, *De Musica*; but no such treatise is enumerated in the list of his works by Baronius or Fabricius. This pontiff, however, seems to have interested himself very much about ecclesiastical music. The attempts at discant, or extemporaneous counterpoint, were thought so licentious in his time, that he prohibited the use of it in the church by a bull in 1322. There is, however, at the end of it this favourable clause: "It is not our intention wholly to prevent the use of concords in the sacred service, particularly on great festivals, provided the ecclesiastical chant or plain-song be carefully preserved. The Abbé Lebauf observes, that those who drew up this bull, which is inserted in the body of canon laws, erroneously confined discant to fourths, fifths, and eighths, from the perusal of ancient authors on the subject of music, particularly Cassiodorus, where they had found the following definition: "*Symphonia est temperamentum sonitus gravis ad acutum, vel acuti ad gravem, modulamen efficiens, sive in voce, sive in percussione, sive in flatu. Symphoniz sunt sex: prima, diatessaron: secunda, diapente: tertia, diapasen. Quarta, diapasen et diatessaron: quinta, diapasen et diapente: sexta, diapasen et diapasen.*"—"Symphony, or music in conso-

nance, is the mixing grave sounds with acute, or acute with grave, either in singing or playing upon stringed or wind instruments. Symphonic concords are six; the fourth, fifth, and eighth, with their octaves. It is hardly possible to read this passage, and not give up the contest concerning ancient counterpoint, or at least reduce it to the meagre kind of which Padre Martini has framed an example in his *Storia Musica*.

JOHN XXII. or XXIII. pope, formerly known by the name of Balthasar-Cossa, was a native of Naples, and being descended from a noble and wealthy family, he enjoyed the advantages of an excellent education at Bologna, where he took his degrees, and from thence he set out to Rome, anticipating the honours that seemed to be reserved for him, for on being asked by some of his friends whither he was going, he replied "to the papedom." Scarcely had he arrived at this great city, when he was made chamberlain to pope Boniface IX. who, in 1402, promoted him to the purple. He took an active part in the deposition of Gregory XII. and exerted all his talents, influence, and property to secure the election of Alexander V. Soon after that pontiff's election the plague obliged him to quit Pisa, and he was prevailed upon by cardinal Cossa to pay a visit to Bologna. Here he found means to detain the pope, under various pretences, till his holiness fell dangerously ill, and his complaints proved fatal to him. The subject of our present article has lain under the heavy charge of causing him to be poisoned by his physicians: he was, however, elected his successor, and from the title of cardinal Cossa he assumed the name of John XXIII. On the very day that he was raised to this high dignity in the church, he wrote to all Christian princes, acquainting them of his promotion, and exhorting them to support his claims against the pretensions of those who had been condemned and deposed by the church universal. One of the earliest objects of John's administration was to raise a fund to support the claims of his friend Lewis of Anjou, in opposition to those of his inveterate enemy, Ladislaus, to the possession of the kingdom of Naples. In his progress he solemnly excommunicated Ladislaus, and then ordered a crusade to be preached against him all over Christendom. By the bull issued on this occasion, all were exhorted to take the cross and engage in this holy war; and to all who should embark in it, the same indulgences were granted as to those who went to the conquest of the Holy Land. In a short time peace was restored; this was effected by John's taking off the excommunication from Ladislaus, who, in return, agreed to abandon the cause of Gregory, whom he had hitherto vindicated as the true pope. After the restoration of tranquillity, John made a promotion of fourteen cardinals, and summoned all the prelates of the church to attend a general council at Rome. At this council few bishops were present, its proceedings were, probably, unimportant, except in this, that it condemned the doctrine of Wickliff, and ordered his works to be committed to the flames. Ladislaus took the first opportunity of attacking pope John: the pontiff appealed to all Christian princes, exhorting them to appoint a general council to put a stop to the reigning evils, and to unite the whole church under one head. The choice of the place was left to the emperor, who fixed on Constance. Here the council was opened on the 1st of November 1414. After many sessions a list of accusations against the pope was read, containing seventy articles, some of which, however, were too scandalous even to be gone into: the others related to the pope's simony and tyranny; and to the means which he took of amassing immense riches. After these articles, and the depositions in support of them, were read and examined, the

council declared them to be fully proved, and then unanimously passed a sentence of suspension against the pope. This sentence was communicated to him by a deputation from the council. After this, viz. on the 29th of May 1415, the council proceeded a step farther, and unanimously passed the definitive sentence of John's deposition, and ordered his seals to be broken. He was then committed to the care of Lewis, duke of Bavaria, and count palatine of the Rhine, who kept him prisoner, but treated him with civility and respect. At the expiration of about four years he obtained his liberty, and made such concessions to the existing pope Martin V. that he created him cardinal bishop of Tusculum, and dean of the sacred college: he also ordained that he should always sit next to the pope, and that his seat should be elevated a little above those of the other cardinals. He did not live many months to enjoy these honours. His character has already been described: he was unquestionably vicious and destitute of good principles, and merited that fall which he experienced. He was author of a poem "*De Varietate Fortunæ*," which is said to be distinguished by genius and taste. His bull for assembling the council of Constance; the form of his resignation, and some of his letters, are still extant. For farther particulars relating to the popes John, the reader is referred to Bower's History.

JOHN of Bayeux, known also by the name of John of Avranches, an illustrious Gallican prelate in the eleventh century, the first of all the bishops of Avranches, and afterwards promoted to the archiepiscopal see of Rouen. He held a provincial council in the year 1074, at which several statutes were passed for the regulation of ecclesiastical discipline, which provoked the resentment of the lax and dissipated clergy, who obliged him to seek for safety in flight. Other persecutions obliged him to resign his preferment, and retire to his country house: here he was attacked by the monks of the abbey of St. Owen, who killed him on the spot. He was author of a work "*On the Duties of Ecclesiastics*," which was first published with notes, by John le Prevot, canon of Rouen. Moreri.

JOHN DAMASCENUS, or St. John of Damascus, who lived in the eighth century, is celebrated by the writers of his life, and by ecclesiastical historians, as the compiler and reformer of chants in the Greek church, in the same manner as St. Gregory in the Roman. And Leo Allatius, under the title of *Oñōchus*, tells us they were composed by John Damascenus. Zarino goes still farther, and informs us that in the first ages of Christianity the ancient Greek notation by letters having been thrown aside, John Damascenus invented new characters, which he accommodated to the Greek ecclesiastical tones; and that these characters did not, like our's, merely express single sounds, but all the intervals used in melody; as a semitone, tone, third minor, third major, &c. ascending and descending with their different duration.

This resembles, in many particulars, the notation in ancient Romish missals, before the time-table and characters in present use were invented, or even the Gregorian notes generally received.

JOHN DE MURIS. See MURIS.

JOHN of Salisbury, a learned Englishman of the 12th century, was elected bishop of Chartres in France in the year 1177, an office which he held about four years when he died. He wrote the life of Thomas à Becket and several other works. This learned prelate seems to have been much offended and scandalized at the licentiousness of the singers in performing the sacred rites. We should suppose, by his censures, that the choral band was outrageously addicted to flourishing, and that many of them sung in falsetto. What

the complaints of the good bishop of Chartres were, the following passage from his Policraticus will shew.

"Musica cultum religionis inest, quod ante conspectum Domini, in ipsis penetralibus sanctuarii, lascivientis vocis luxu, quadam ostentatione sui, muliebribus modis notularum articulorumque casuris, stupentes animulas emollire nituntur. Cum præcinentium, et succinentium, canentium, et decinentium, intercinentium, et occinentium, præmolles modulationes audieris, Sirenarum concentus credas esse, non hominum, et de vocum facilitate miraberis, quibus philomela vel psittacus, aut si quid sonorius est, modos suos nequeunt coequare. Ea siquidem est ascendendi descendendique facilitas; ea sectio vel geminatio notularum, ea replicatio articulorum, singulorumque consolidatio; sic acuta vel acutissima, gravibus et subgravibus temperantur, ut auribus sui indicii fere subtrahatur autoritas." Policraticus, sive de Nugis Curialium, lib. i. c. 6.

"The rites of religion," says he, "are now profaned by music: and it seems as if no other use were made of it than to corrupt the mind by wanton modulations, effeminate inflections, and frittered notes and periods, even in the *Pens-tralia*, or awful sanctuary itself. The stupid crowd, delighted with all these vagaries, imagine they hear a concert of sirens, in which the performers strive to imitate the notes of nightingales and parrots, not those of men; sometimes descending to the bottom of the scale, sometimes mounting to the summit; now softening and now enforcing the tones, repeating passages, mixing in such a manner the grave sounds with the more grave, and the acute with the most acute, that the astonished and bewildered ear is unable to distinguish one voice from another."

JOHN of Ragusa, a learned Catholic prelate, who flourished in the fifteenth century, was born in the city whence he derived his surname. While young he entered himself among the preaching friars, and applied with such diligence to his studies, that he became one of the most learned men of his time. He was particularly celebrated for his deep acquaintance with the Oriental languages. In 1426 he was appointed attorney-general of his order at the court of Rome, and was nominated by pope Martin V. one of his divines at the council of Basil. At this assembly he was the principal disputant against the doctrines promulgated by John Hufs. After this he was sent on different legations to Constantinople, with a design of bringing about an union between the eastern and western churches, but his exertions were not attended with success. On his return to Italy he was nominated to the see of Argos in the Peloponnese. It has been asserted by some authors that he was made a cardinal. His works are "*A Discourse against the Hussites*:" "*Acts of his Legation to Constantinople*:" and "*An Account of his Travels in the East*." Moreri.

JOHN, *Prester*. See PRESTER.

St. JOHN's Bread, in Botany. See CERATONIA.

JOHN's Sweet. See PINK.

St. JOHN's Wort. See HYPERICUM.

St. JOHN's Wort, *Hypericum perforatum*, in the *Materia Medica*, a species of hypericum which grows, commonly to the height of a foot and a half, in woods and uncultivated grounds, and flowers in July. This plant has a bitterish, sub-astringent taste, and a sweetish smell. Among the ancients it was in great repute; and they prescribed it in hysteria, hypochondriasis, and mania: they also imagined that it had the peculiar power of curing demoniacs, and it thence obtained the name of "*fuga dæmonum*." It was also recommended internally for wounds, bruises, ulcers, hæmoptysis, mistus cruentus, gravel, dysentery, agues, worms; and outwardly as an anodyne, and as a discutient and detergent.

tergent. However, it is now very rarely used. The flowers only are directed for use, as containing the greatest proportion of the resinous oily matter, in which the medical efficacy of the plant is supposed to reside. The dark puncta of the petals and the capsules afford this essential oil, which is contained in minute vesicles, or glands, and gives a red colour to rectified spirit, and to expressed oils: the latter has been long known in the shops by the name of "*oleum hyperici*." The colouring matter is said to give a good dye to wool. Woodville's Med. Bot.

JOHN'S, *St.*, College, in America. See COLLEGE.

JOHN de Frontera, *St.*, in Geography. See JUAN de la Frontera.

JOHN'S Haven, a small sea-port town in the parish of Benholme, and shire of Kincardine, Scotland, was formerly one of the most considerable fishing towns on the southern coast of Scotland. At present, however, it is much reduced, its trade declined, and population diminished. A company of sail-cloth manufacturers have established works here, and thus given employment to the inhabitants. The population of the parish, in the year 1793, was calculated at 1019. This place is 9 miles north of Montrose.

JOHN'S Islands, islands of America, near the coast of South Carolina, S.W. of Charlestown harbour, divided from James's island by the river Stono, which forms a convenient and safe port.

JOHN'S Island, an island in the bay of Quinta, Upper Canada, opposite the Mohawk settlement, west of Richmond.

JOHN, *St.*, a town of the island of May, one of the cape Verd islands.—Also, one of the Virgin islands, in the West Indies; 12 leagues E. of Porto Rico; about five miles long, and one broad; said to be the best watered of all the Virgin isles, though it has little good land, and its exportations are trifling. Its harbour, called "Crawl bay," is reckoned better than that of St. Thomas, and is accounted the best to the leeward of Antigua. N. lat. 18° 7'. W. long. 64° 32'.—Also, a sea-port town well built, on the west coast of the island of Antigua. It is situated in a parish of the same name, on Loblolly bay. It is the capital of the island, and a port of entry. Its harbour is excellent and well fortified. This town is the residence of the governor-general of the leeward Charaibe islands; here the assembly is held; and its port carries on a great trade. This town was nearly destroyed by fire in August 1769; upwards of 260 houses being consumed, besides wharfs, cranes, &c. N. lat. 17° 4'. W. long. 62° 4'.—Also, an island, called also Prince EDWARD'S Island (which see), in the gulf of St. Lawrence, situated at a small distance to the west of the island of Cape Breton, and to the north of Nova Scotia, to which it is attached. Its coasts on the north and south are much intersected with bays; it is well watered by rivers, and its soil is for the most part rich and fertile. It formerly belonged to the French, who improved it to such advantage, that it was deemed the granary of Canada, which it supplied with plenty of corn, as well as beef and pork. On the conquest of Cape Breton in 1745, the inhabitants quietly submitted to the British arms. Its capital is Charlotte's town, which is the residence of the lieutenant-governor, who is the chief officer in the island: its other towns are George town, Prince's town, Hillborough town, Pownal town, Maryborough town, &c. Its length from N.E. to S.W. is reckoned about 100 (Pinkerton says 60) miles, and its mean breadth is 30 miles. The whole island is divided into three counties, viz. King's, Queen's, and Prince's counties, which are subdivided into 14 parishes, consisting of 27 townships, and comprehending in all 3,363,400 acres. The

number of inhabitants is estimated at about 5000. N. lat. 46° 20'. W. long. 63°.—Also, a small island in the Pacific ocean, east of New Ireland, so called by Schouten, and by Bougainville Bourmand. S. lat. 4°. E. long. 153° 50'.—Also, a small island in the Red sea.—Also, a small island in the West Indies, north of St. Croix, and south of Tortola; noted for its fine harbour, which, it is said, is sufficient to contain the whole British navy.—Also, a bay and island on the west coast of Newfoundland, in the gulf of St. Lawrence, at the S.W. end of the straits of Bellefleur.—Also, a town on the east coast of Newfoundland. N. lat. 47° 35'. W. long. 52° 20'.—Also, a town of America, being the north-westernmost in Sussex county, Delaware, situated at the head of Nanticoke river, about 22 miles S.W. of Dover. N. lat. 38° 48'. W. long. 75° 40'.—Also, a town and fort in Lower Canada, on the west bank of Sorel river, at the north end of lake Champlain, 28 miles south of Montreal. This town has been established as the sole port of entry and clearance for all goods imported from the interior of the United States into Canada, by the executive council of Lower Canada, in July 1796. N. lat. 45° 9'. W. long. 72° 18'.—Also, a sea-port on the S.E. coast of the island of Tinos. N. lat. 37° 32'. E. long. 25° 15'.—Also, a river of America, in East Florida, which rises in a swamp in the interior of the province, and pursues a northern course, in a broad navigable stream, spreading frequently into spacious bays or lakes, of which lake George is the chief. At its mouth is a shifting bar; 10½ leagues north of St. Augustine.—Also, a river, called Little St. John's, which rises in a swamp called Ouaquephenogaw, and after a winding course of about 200 miles, falls into Apalache bay, about 10 miles east of Apalache river. It is said to be the purest and clearest of any in America, receiving, as the Indians say, no tributary streams, but being fed by springs which gush through its banks, and is about 200 yards broad, and about 15 or 20 feet deep at the town of Talahafochete.—Also, a river which is the largest in the British province of New Brunswick. From its mouth on the north side of the bay of Funchal to its main source it is computed to be 350 miles; the tide flows 80 or 90 miles up this river; and it is navigable for sloops of 50 tons 60 miles, and for boats 200. Its general course from its origin is E.S.E. It is the common route to Quebec. It furnishes the greatest plenty of salmon, bass, and sturgeon. This river is fed by many tributary streams, and in its various branches it waters and enriches a large tract of excellent country, which is settled and under improvement. The uplands are, in general, covered with fine timber, such as pine and spruce, hemlock and hard wood, principally beech, birch, maple, and ash. The pines on this river are the largest in British America, and afford a considerable supply of masts for the British navy.—Also, a river of Africa, which runs into the Indian sea, S. lat. 31° 20': and another of Africa, which runs into the Atlantic, N. lat. 19° 20'.—Also, a lake in Lower Canada, which receives rivers almost in every direction, and discharges its waters through Saguenai river into the St. Lawrence, at Tadoussac. It is about 25 miles in diameter.

JOHNNY GROAT'S HOUSE, the most northerly dwelling of Scotland, in the county of Caithness; one mile W. of Duncanby Head.

JOHNSBURY, a township of America, in Caledonia county, Vermont, bounded S.W. by Danville; containing 663 inhabitants.

JOHNSON, JOHN, in Biography, a learned divine of the church of England, was born at Friendsbury, near Rochester, in Kent, in the year 1662. He received the elements of a good education at King's school, Canterbury, and from

thence he was sent, when he was about 15 years of age, to Magdalen college, Cambridge. Here he took his degrees and entered into deacon's orders, and shortly after obtained a curacy near Canterbury. In 1686, he was ordained priest, and collated by archbishop Sancroft to the vicarages of Bocton and Hearne-Hill. After the revolution he complied with the new order of things, and became an able advocate in its defence, which gained him the friendship and patronage of archbishop Tension, from whom he received several instances of church preferment, and in 1707, was collated to the vicarage of Cranbrook. Here he seems to have completely abandoned his friends and his principles, and to have advanced from step to step till he even denied the king's supremacy, and refused to read the prayers enjoined on the accession of George I. Notwithstanding this dereliction of principle, he was twice chosen proctor in convocation for the diocese of Canterbury. He died in 1725, having been several times under prosecution, from the effects of which he was released by submission to the higher powers: had his fortitude been equal to his zeal, he would have suffered in defence of the most arbitrary and indefensible opinions, that can well be broached by a man of sense. Johnson was unquestionably a man of sound learning; his morals were exemplary and his piety unaffected. He was diligent in the discharge of the several duties belonging to the pastoral office, but his temper was bad, and during the latter years of his life, he shewed so much bigotry and intolerance against those who thought as he himself had formerly thought, as detracted from the value of his good qualities. His principal works are "The Clergyman's Vade Mecum;" "A Collection of Ecclesiastical Laws, Canons, &c.;" "The unbloody Sacrifice and Altar unveiled and supported;" and "A Paraphrase on the Psalms in the Liturgy." After his death his surviving daughter published two volumes of his posthumous sermons and discourses. Biog. Brit.

JOHNSON, SAMUEL, an English divine, was born in the year 1649, in the county of Stafford, though others have named Warwickshire as his birth-place. He was educated at St. Paul's school, London, whence he was removed to Trinity college, Cambridge. After he had taken orders, he was presented to the rectory of Corringham, in the hundreds of Essex, but the place not agreeing with his health, he removed to London, and took an active part in the political discussions of the times. He was introduced to lord Russell, who immediately made him his domestic chaplain. He now became a formidable writer in the cause of liberty, and was called on during the reign of Charles II. to bear his testimony to the truth by severe imprisonment. But his sufferings were brought to the acme by a paper which he drew up in the year 1686, when the army was encamped upon Hounslow Heath, entitled, "An humble and hearty Address to all English Protestants in the present Army." For this he was brought to trial, and condemned to stand in the pillory at three places, to pay a fine of 500 marks, and to be publicly whipped from Newgate to Tyburn. Before they executed this savage sentence they intended to degrade and deprive him of his orders, but fortunately for the sufferer, the prelates Crew, Sprat, and White, too eager, probably, to perform the commands of the tyrant, forgot to strip off his cassock. This informality was fatal to their plans, and they found it impossible to take away his living. Notwithstanding the laceration of his body, his heart was unbroken, and he continued to employ his pen in the same cause, till the revolution changed his situation. Parliament now declared that the proceedings against him were illegal, and the house of lords addressed king William to confer upon him some preferment. Johnson was ambitious of a

bishopric, but he was offered a deanery; this he did not accept, but received a pension of 300*l.* *per annum* during his own and his son's life, a present of 1000*l.*, and a place of 100*l.* *per annum* for his son. A tract, which he afterwards published, was the cause of so much personal violence as nearly to have cost him his life: the piece was entitled "An Argument proving that the Abrogation of King James by the People of England from the Royal Throne, and the Promotion of the Prince of Orange in his stead, was according to the Constitution of the English Government, and prescribed by it." It was, unquestionably, on account of this pamphlet that seven ruffians broke into his house early in the morning, assembled round his bed, gave him a wound on the head with a sword, and otherwise ill-treated him. They threatened to take his life, but shrinking from so foul a deed, they left him wounded, and did no injury to his house or effects. Notwithstanding his general attachment to the new government, he did not spare its defects; he complained grievously of the duration of parliaments, which he maintained ought to be continued for one year each only. On some occasions his opposition was carried so far as to lead his best friends to suspect he was about to abandon his original principles. He died in 1703, and his works were collected and printed in one volume folio. Biog. Brit.

JOHNSON, SAMUEL, a celebrated English writer, was born at Litchfield, in the year 1709, in which city his father carried on the bookselling business on a very small scale. He was educated partly at the free-school of his native city, and partly at Stourbridge, in Worcestershire. He was probably intended for trade, but having acquired a reputation for learning, his father very willingly complied with the proposal of Mr. Corbet, of maintaining Samuel at Oxford, as companion to his son. He accordingly was entered a commoner of Pembroke college, in the year 1728, when he was in the nineteenth year of his age. Johnson was careless of his character with respect to the discipline and the studies of the place, yet he obtained credit by some of his compositions, of which the most distinguished was a translation into Latin of Pope's Messiah, written with great spirit and vigour. He remained at Oxford but three years, during a part of which he had to struggle with the gripping hand of penury. Soon after his return home, his father died in very narrow circumstances, and about this time it appears, from his own account, that he was first led to think in earnest of religion, by the perusal of Law's "Serious Call to the Unconverted." He engaged himself as usher to the grammar school of Market Bosworth, Leicestershire, but the treatment which he met with at this place ill accorded with his feelings, and he quitted the school, and passed some time with a friend at Birmingham. Here he wrote some literary essays, and translated and abridged from the French the account of the voyage to Abyssinia, by father Lobo. This was published without the translator's name, at London, in 1735. Returning to Litchfield, he issued proposals for publishing by subscription, the Latin poem of Politian, but they did not meet with encouragement, and the design was abandoned. He now made a bold effort to improve his situation, married the widow of Mr. Porter, a mercer of Birmingham, and opened a school. He had received 800*l.* with his lady, and depending on his own learning and powers, he took a large house, and advertised for scholars to be boarded and instructed in the Greek and Latin languages. His plan did not succeed; not more than three scholars offered, among these was the celebrated David Garrick. After a year's trial he abandoned his school, and resolved to become a literary adventurer in the metropolis. He accordingly set out, taking his scholar

Garrick as his companion, being furnished with commendatory letters by Mr. Gilbert Walmisley, a gentleman who had been before the friend and benefactor of Johnson. Johnson and his friend arrived in London in March 1737; his first and principal engagement was with Cave, the proprietor of the *Gentleman's Magazine*, and at the desire of this gentleman he undertook a translation of Father Paul's *History of the Council of Trent*, which was partly printed and then the scheme was given up. At this period Johnson became acquainted with Savage, in whose misfortunes he sympathized, and in whose company he was a spectator of the vices and disorders of the metropolis, and probably a sharer in the hardships which he endured, and in the irregularities which he committed, but whatever stain the morals of Johnson might receive from this connection, it was obliterated by the permanent influence of the principles of piety and virtue. The literary piece which brought him into public notice, was entitled "London, a Poem;" written in imitation of Juvenal's Third Satire. For this he received of Dodsley the sum of 10*l*. It was printed without any name, but it was said by Pope, then in the height of his popularity, that the author of so good a satire could not remain long concealed. Johnson, at this period, wanted something more substantial than mere praise, and offered himself as a candidate for the mastership of a free-school in the country. This he was unable to attain, because it was necessary that the master should have taken his degree of M. A. This he had neglected to do while he was at Oxford, and now he had applied for the honour to the university of Dublin, through the medium of lord Gower, who, in writing to his friend on the subject, says, "he is not afraid of the strictest examination, though he is of so long a journey; and yet he will venture it, if the dean (Swift) thinks it necessary, choosing rather to die on the road, than to be starved to death in translating for the bookfellers, which has been his only subsistence for some time past." This application produced no effect, and he was obliged to content himself with the patronage of the London bookfellers, particularly with the employment which he obtained in the *Gentleman's Magazine*. In this work were given the parliamentary debates, under the fiction of "Debates in the Senate of Liliput," and the speakers were disguised under feigned names. Guthrie, for a time, composed these speeches from such hints as he could bring away in his memory. Johnson first assisted in this department, and then entirely filled it, and the public was highly gratified with the eloquence displayed in these compositions. In 1739 he published a humorous pamphlet, entitled "*Marmor Norfolciense*," consisting of a supposed ancient prophecy in Latin monkish rhymes, with an explanation. He composed, about the same period, several biographical articles for the *Gentleman's Magazine*, of which the principal was the life of Savage, which was afterwards published separately, and has been universally admired both as a most interesting and curious portrait, and as containing many admirable reflections on life and manners. In the year 1747 he published the plan of his *English Dictionary*, addressed to the earl of Chesterfield, whom he would gladly have recognized as his patron in this arduous task. But his lordship concerned himself very little about the author or his work. No two men could be more opposite in their manners than Johnson and lord Chesterfield, and a very slight intercourse on this occasion terminated in their mutual aversion, so that the author in his preface informed the public, that "the *English Dictionary* was written with little assistance of the learned, and without any patronage of the great; not in the soft obscurities of retirement, or under the shelter of academic

bowers, but amidst inconvenience and distraction, in sickness and in sorrow." From the bookfellers, Johnson received fifteen hundred guineas for his labour, which was not completed till the year 1755. The intervals of this compilation were sufficient to allow of various literary avocations. In 1747 he wrote a prologue on the opening of Drury-lane theatre. In 1749 he produced another imitation of Juvenal, entitled "*The Vanity of Human Wishes*;" and his tragedy of "*Irene*." He next commenced his periodical work, entitled "*The Rambler*," which came out in papers at the rate of two in a week, from the month of March 1750, till the same month in 1752. He was the author of the whole of this work, with the exception of about ten papers only, and in it he appears the warm and steadfast friend of religion and morality. The serious style of the *Rambler* prevented it at first from attaining a very extensive circulation, but after it was collected into volumes, it rose in the public estimation, and the author saw the publication of the tenth edition. Soon after the close of this paper he had the misfortune to lose his wife, a circumstance which he never ceased to deplore. Not long afterwards he took into his house, as an inmate, Mrs. Anne Williams, the daughter of a physician in South Wales, who had consumed his time and fortune in pursuit of the longitude. Her destitute condition, aggravated by blindness, with her talents for writing and conversation, recommended her to the benevolence of Mr. Johnson. In the "*Adventurer*," conducted by Dr. Hawkworth, he interested himself, supplied it with several papers of his own, and obtained for it the contributions of Mr. Warton. Previously to the publication of his dictionary, the degree of M. A. was conferred on him by the university of Oxford, and about the same time the earl of Chesterfield wrote two letters in its favour in "*The World*." This civility was regarded, by Johnson, as an advance from that nobleman for the purpose of obtaining from him a dedication as patron of the work, but he now rejected the patronage which he would before have gladly accepted, and wrote a letter to the noble lord, in which he employed all the force of pointed sarcasm and manly disdain to make him ashamed of his former conduct. The dictionary was received by the public with general applause, and its author was immediately ranked among the greatest benefactors of his native tongue. The publication of this great work did not relieve him from his embarrassments, for the price of the labour had been consumed in the progress of its compilation. He was still entirely dependent upon the exertions of the day for its support, and so low was he reduced, though now regarded as an honour to his country, that in the following year he was put under an arrest for the trifling sum of five or six pounds. In 1758 he began "*The Idler*," a periodical paper, which was published in a weekly newspaper. On the death of his mother in 1759, he wrote the romance of "*Rasselas*," to defray the expences of her funeral, and to pay her debts. This, though written in a very hasty manner, is reckoned one of his most splendid performances: it is elegant in language, rich in imagery, and weighty in sentiment. It has been translated into several modern languages. Such, however, was the depressed state of his finances, that he was obliged to break up house-keeping and retire to chambers. From this situation he was rescued by the grant of a pension of 300*l*. *per annum*, in 1762, without any stipulation with respect to his literary exertions. In 1765 he had the honour of an interview with his majesty in the royal library, when the sovereign asked if he intended to publish any more works? To this he replied, that he thought he had written enough, on which the king,

king said, "I should have thought so too, if you had not written so well." In this year he published his edition of Shakspeare's Works, which was sent into the world with a preface, written with all the powers of his masterly pen, and which is reckoned among the most valuable of his critical disquisitions. About this period he instituted a literary club, consisting of several of the most celebrated men of the age, among whom were some who occupied very elevated situations in society. In 1770 he appeared an advocate for the measures of government, and published, first, "The False Alarm," occasioned by the expulsion of Mr. Wilkes from the house of commons. This was followed by "Thoughts on the late Transactions respecting Falkland's Island," designed to shew the unreasonableness of going to war on account of the conduct of Spain relative to that barren possession. His next publication on political subjects was entitled "The Patriot," which was composed on the eve of a general election in order to indispose the people against the measures of the opposition. In 1775 he published, "Taxation no Tyranny," which was written in defence of the right of the mother country taxing the colonies at pleasure. These pamphlets, which were probably written on principle, did but little service to the cause which he vindicated. In 1773 he went on a tour with Mr. Boswell to the western islands of Scotland, of which journey he published an account under the title of "A Journey to the Western Islands of Scotland." In this he gave a most decisive opinion against the authenticity of the poems ascribed to Ossian, which occasioned a difference between him and the translator, Mr. Macpherson. In 1775, the university of Oxford conferred on him, through the interest of the minister, the degree of doctor of laws, which he highly valued. The same honour had been given him some years before by the university of Dublin, of which he had made no use. When the unhappy Dr. Dodd lay under sentence of death, in Newgate, Johnson, moved either by compassion for the man, or by a desire of rescuing the cloth from public disgrace, wrote two petitions to his majesty in his name, and supplied him with a speech at the bar, and a sermon to be preached to his fellow convicts. (See DODD.) In the year 1779, Dr. Johnson began his last literary undertaking, "The Lives of the English Poets," which, notwithstanding the strong prejudices of the author, may be regarded as a most valuable treasure of sound criticism, and a model of literary biography. This work was completed in 1781: it is not only attached to his edition of the English poets, but has been re-printed a great many times in a separate form. The concluding portion of Dr. Johnson's life was clouded over by the loss of several highly respected friends, by a progressive decline of health, and by the prospect of approaching dissolution, which neither his religion nor his philosophy taught him to bear with even decent composure. At last, however, his mind became calm, composed, and truly resigned: he died December 13th, 1785, in the 75th year of his age. His remains, attended by a respectable concourse of friends, were interred in Westminster abbey; and a monumental statue has been erected to his memory in St. Paul's cathedral. His works, with a life of the author, were published collectively in 11 volumes, 8vo. by sir John Hawkins, in 1787; and in 1792, a new edition of them in 12 volumes, with a life by Mr. Murphy, was given to the public. Mr. Boswell and Mrs. Piozzi have likewise given ample accounts of their friend: perhaps there is no instance of a private man of letters, in this country, whose decease was marked by the appearance of so many laudatory and biographical tributes to his public reputation. As a writer, Dr. Johnson did much service to his country, by fixing its language and regulating

its morality. In his person he was large, robust, and unwieldy; in his dress he was singular and slovenly; in conversation he was positive, and impatient of all contradiction. But with these deductions, he was an excellent character; he had a heart full of tenderness and compassion, and all his actions were the result of principle. He was a zealous advocate for what he regarded as the truth. He was high in his religious and political principles, and at one period of his life he was friendly to the views of the house of Stuart. He had a noble independence of mind, and would never stoop to any man however exalted, nor disguise his sentiments to flatter another. His judgment was uncommonly acute, his imagination quick, his memory tenacious, and his conversation, though very dictatorial, was often brilliant, and always instructive. For farther particulars, the reader is referred to the works above mentioned.

JOHNSON, in *Geography*, a county of America, in North Carolina and Newbern district, containing 6201 inhabitants, of whom 1763 are slaves. It is 30 miles square, and watered by several streams. The greatest part of the county is level, and its principal produce is corn. Its chief town is Smithfield.

JOHNSONIA, in *Botany*, so named by Mr. R. Brown in memory of Dr. Thomas Johnson, author of some little botanical works, published in the form of travels between 1629 and 1641, and editor of the second edition of Gerard's Herbal in 1633. Wood says he was killed, while fighting in the royal cause, in September 1644. Brown. Prodr. Nov. Holl. v. 1. 287. Class and order, *Triandria Monogynia*. Nat. Ord. *Asphodeli*, Juss.

Ess. Ch. Perianth (rather corolla) in six deep equal segments, withering, deciduous. Filaments dilated and united at their base, inserted into the base of the inner segments of the corolla. Style thread-shaped. Stigma obtuse. Capsule superior, of three cells and three valves, with partitions from the middle of the valves. Seeds two in each cell, inserted into the central column, one of them pendulous. Scar crested.

1. *J. lupulina*. Native of the south coast of New Holland. Root fibrous, perennial. Leaves two-ranked, twisted, linear, dilated, and half sheathing at the base. Stalk radical, simple, bearing near its top a solitary, oblong, hop-like spike of small sessile flowers, with coloured imbricated bractes, the lowermost of which are small and barren.

JOHNSTON, JOHN, in *Biography*, an eminent naturalist, was born at Sambter, in Great Poland, in the year 1603: he received the greater part of his education in his own country; but in 1622, he came to England, and from thence he went to Scotland, where he studied with great diligence in the university of St. Andrews till the year 1625. He afterwards studied at Leyden and Cambridge. He undertook the education of the two sons of the count de Kurtzbach, and accompanied them to Holland. While he resided with his pupils at Leyden, he took his degree as doctor of physic; and when he went a third time to England, the same honour was conferred on him by the university of Cambridge. He died in June 1675, in the 72d year of his age. He is known in the literary world by a number of works in the different departments of natural history. Gen. Biog.

JOHNSTON, in *Geography*, a township of America, in Providence county, Rhode island, west of the town of Providence; containing 1364 inhabitants.—Also, a township in Franklin county, Vermont; having 135 inhabitants.

JOHNSTONE, GEORGE, in *Biography*, a naval commander, son of a Scotch baronet, devoted himself to the sea service at an early period of life. After passing through the subordinate

subordinate stations, he was, in the year 1760, made master and commander; and in two years after, he was raised to the rank of post captain. At the peace, he was appointed governor of West Florida; and on his return to England, he took an active part in the affairs of the East India company, particularly in opposition to lord Clive. In 1771 he wrote a work, entitled, "Thoughts on our Acquisitions in the East Indies, particularly respecting Bengal." He sat twice in parliament, first for Cockermouth, and afterwards for Appleby. He had a duel with lord George Germaine, on account of some reflections which fell from him in the house respecting his lordship. He was one of the commissioners sent to treat with the Americans. He died in 1787.

JOHNSTONE'S Straits, in *Geography*, a channel of the Pacific ocean, between the island of Quadre and Vancouver, and the west coast of North America. This channel branches off from the northern part of the gulf of Georgia, from point Chatham to the west, bearing a little north for about 60 miles in length, the breadth being from two to four. N. lat. $50^{\circ} 20'$ to $50^{\circ} 35'$. E. long. 233° to $234^{\circ} 46'$.

JOHNSTOWN, a post-town of America, and capital of Montgomery county, in the state of New York, situated on the north bank of Mohawk river, 24 miles west of Schenectady. The town contains about 70 houses, a Presbyterian and an Episcopal church, a court-house, and a gaol. In the township are 3932 inhabitants.—Also, a town in the township of Edwardsburgh, Upper Canada, situated upon the river St. Lawrence, above the uppermost rapids, in ascending to lake Ontario. From this town vessels may be navigated with safety to Queenstown, and at the ports of lake Ontario.

JOHNSTOWN, New, a town in the township of Cornwall, Upper Canada, situated upon the river St. Lawrence, below the long Saalt, to the northward of Grand Isle St. Regis; and is now called Cornwall.

JOHNSTOWN, the name of several villages in Ireland. One of these, in the county of Kilkenny, has been lately made a post-town. It contains a number of neat houses, built for the accommodation of those who frequent the neighbouring chalybeate Spa of Ballyspellan. It is on the mail-coach road from Dublin to Cork, through Cashel, and is 60 miles S.W. from Dublin.—Another Johnstown, in the county of Kildare, is about 13 miles from Dublin, on the Great Southern road; and in consequence of a good inn, is frequently made a stage by those who travel post.—Two others, called St. Johnstown, were formerly boroughs represented in parliament: one of them in the county of Donegal, on the river Foyle, which is here of considerable breadth, 87 miles N. by W. from Strabane, and $108\frac{1}{2}$ N. by W. from Dublin; the other in the county of Longford, 6 miles W. from Granard.—There is also a small town called Johnstown Bridge, in the county of Kildare, on the borders of Meath, situated on the river Blackwater, 21 miles from Dublin.

JOHOR, a town of the peninsula of Malacca, near the south coast, and capital of a kingdom of the same name. N. lat. $1^{\circ} 40'$. E. long. $103^{\circ} 54'$.

JOIGNY, a town of France, and principal place of a district, in the department of the Yonne, near the river Yonne. The place contains 5219, and the canton 13,137 inhabitants, on a territory of $207\frac{1}{2}$ kilometres, in 17 communes; 14 miles N.W. of Auxerre. N. lat. $47^{\circ} 59'$. E. long. $3^{\circ} 29'$.

JOINAGUR. See **JYENAGUR**.

JOINDER, or **JOYNDER**, is the coupling, or joining,

two persons in one action, or suit, against another. See **DEMURRER**.

JOINERY is a branch in *Civil Architecture*, and consists of the art of framing or joining wood together, for internal and external finishings of houses; as the coverings and linings of rough walls, or the coverings of rough timbers, and of the construction of doors, windows, and stairs.

Hence joinery requires much more accurate and nice workmanship than carpentry, which consists only of rough timbers, used in supporting the various parts of an edifice: joinery is therefore used by way of decoration only, and being always near to the eye, and consequently liable to inspection, requires that the joints should be fitted together with the utmost care, and the surfaces made smooth.

The wood used is called stuff, and is previously formed by the pit-saw into rectangular prisms, which are denominated boards, battens, or planks, according to their breadth. Battens run from two to seven inches wide, boards from seven to nine inches wide, and planks from nine inches to any greater breadth that can be cut out of a piece of wood.

The operations of joinery consist of forming surfaces of various kinds, also of grooving, rebating, and moulding, and of mortising and tenoning, and lastly, of joining two or several pieces together, so as to form a frame or solid mass.

Surfaces, in joinery, are either plane or curved, but most frequently plane.

All kinds of surfaces are first formed in the rough, and finally brought to exact forms by means of tools adapted thereto.

Grooving consists in taking away a part of a rectangular section from a piece of wood, so as to form a channel of equal-breadth throughout, with three surfaces, one being parallel, and the other two perpendicular to the surface of the wood from which the channel is recessed: the channel thus formed is called a groove.

Rebating consists in taking away a part from a piece of wood of a rectangular section, so as to leave only two sides, each of a parallel breadth, the one side being perpendicular to the surface of the wood, and the other parallel thereto: the cavity thus formed is called a rebate. From this definition it is manifest, that a rebate can only be formed by reducing the piece of wood to be rebated at the angle itself, and may therefore be looked upon as a half groove.

A mortise is a cavity recessed within the surface of a piece of wood, with four sides perpendicular to that surface, and likewise to each other: the act of making a mortise is called mortising.

A tenon is a projection formed on the end of a piece of wood with four plane sides, at right angles to each other, and to a plane, from which it projects; and this plane is called the shoulder of the tenon.

In the following, all pieces of wood whatever are supposed to be rectangular prisms, and the length in a direction of the fibres; two of the sides of every mortise to be perpendicular, and the other two sides parallel to the fibres; the four sides of every tenon in the direction of the fibres, unless otherwise asserted: likewise, if two of the surfaces of a piece of wood be of greater breadth than the other two, these are called the edges and those the sides, and each line of concourse, formed by two adjacent sides, is called an-arris.

Moulding consists in forming the surface of a piece by curve or plane surfaces, or by both, in such a manner, that all

all parallel sections will be similar figures, that is, their boundaries may be made all to coincide.

The first thing to be done in joinery is to select the stuff or boards, which ought to be well seasoned for every purpose in joinery, and then line it out; and if the stuff is not already at the size, as is most frequently the case, it must be ripped out with the ripping saw, or cross cut with the hand saw, or both, as may be wanted. The next thing is the planing of the stuff first upon a side, then the edge squared, and then gaged to a breadth and thickness, should either or both be found necessary.

Two or more pieces of stuff may be fastened together in various ways by pins of wood or by nails, but in work prepared by the joiner for the use of building, pieces are more frequently joined together by making their surfaces coincide, and then plastering them over with a hot tenacious liquid called glue, then rubbing the surfaces until the glue has been almost rubbed out, and the one piece brought to its situation with respect to the other. The best work is always joined by this method.

When boards are required of a greater breadth than common, several common boards must be fastened together edge to edge, either by nailing them to pieces extending across the breadth, or gluing them edge to edge, or by joining pieces transversely together with small boards, tongued and grooved into the interstices.

Two pieces of stuff are joined together at right or oblique angles by mortise and tenon adapted to each other, and fastened together with glue. When a frame, consisting of several pieces, is required, the mortises and tenons are fitted together, and the joints glued all at one time, then entered to their places, and forced together by means of an instrument called a cramp.

The operation of forming a given surface, by taking away the superfluous wood, is called planing, and the tools themselves planes.

The first tools used by joiners are bench planes, which generally consist of a jack plane, for taking away the rough of the saw and the superfluous wood, only leaving so much as is sufficient to smooth the surface; the trying plane to smooth or reduce the ridges left by the jack plane, and to straighten or regulate the surface, whether it be plane or convex; the long plane when the surface is required to be very straight; and the smoothing plane in smoothing, as its name implies, and giving the last finish to the work.

Besides the bench planes there are others for forming any kind of prismatic surfaces whatever, as rebating planes, grooving planes, and moulding planes: but for a more particular description of these and the bench planes, we shall refer to the article *PLANE*.

The tools employed in boring cylindric holes are a stock with bits of various descriptions and sizes, gimblets and brad awls of several diameters.

The tools used in paring the wood obliquely, or across the fibres, and for cutting rectangular prismatic cavities, are in general denominated chisels: those for paring the wood across the fibres are called firmers, or paring chisels, and those for cutting rectangular prismatic cavities, are called mortise chisels, the rectangular cavities themselves being called mortises when made to receive a projection of the same form and size, and by this means to fasten two pieces of wood together at any angle. The sides of all chisels, in a direction of their length, are straight, and the side of a chisel which contains the cutting edge at the end is steel. The best paring chisels are made entirely of cast steel. Chisels for paring concave surfaces are denominated gouges.

Dividing wood, by cutting away a very thin portion of the material of equal thickness throughout, to any required extent, by means of a thin plate of steel with a toothed edge, is called sawing, and the instruments themselves are called saws, which are of several kinds, as the ripping saw, for dividing boards into separate pieces in a direction of the fibres; the hand saw, for cross cutting and sawing thin pieces in a direction of the grain; the pannel saw, either for cross cutting or cutting very thin boards longitudinally; the tenon saw, with a thick iron back, for making an incision of any depth below the surface of the wood, and for cutting pieces entirely through, not exceeding the breadth of that part of the plate without the iron back; likewise a fash saw and a dovetail saw, used much in the same way as the tenon saw. From the thinness of the plates of these three last saws, it is necessary to stiffen them by a strong piece of metal called the back, which is grooved to receive the upper edge of the plate that is fixed to the back, and which is thereby secured and prevented from buckling. When it is required to divide boards into curved pieces, a very narrow saw without a back, called a compass saw, is used, and in cutting a very small hole a saw of a similar description, called a key-hole saw, is employed. All these saws have their plates longer and thinner, and their teeth finer, as they succeed each other in the order here mentioned, excepting the two last, which have thicker plates and coarser teeth than either the fash or dovetail saw. The external and internal angles of the teeth of all saws are generally formed at an angle of 60 degrees, and the front edge teeth slope backward in a small degree, but incline or recline from the straight line drawn from the interior angle perpendicular to the edge in the plane of the plate, as the saw may be employed in ripping or in cross cutting, or cutting perpendicular to the fibres. The teeth of all saws, except turning and key-hole saws, are bent on contrary sides of the plate, each two teeth succeeding each other, being alike bent on the different sides of the plate; viz. the one as much to the one side as the other is to the other side, and consequently all the teeth on the same side alike bent throughout the length of the plate for the purpose of clearing the sides of the cut which it makes in the wood.

Of all cutting tools whatever, the saw is the most useful to the joiner, as the timber or wood which he employs can be divided into slips or bars of any size, with no more waste of stuff than a slice, the breadth of which is equal to the depth of the piece to be cut through, and the thickness equal to the distance of the teeth between their extreme points on the alternate sides of the saw measured on a line perpendicular to the said sides: whereas, without the use of the saw, cylindrical trees could only be reduced to the intended size by means of the axe; in the use of which there would not only be an immense consumption of stuff, but also much greater labour would be required to straighten it.

Joiners use a small axe, called a hatchet, for cutting off the superfluous wood from the edge of a piece of a board, when the waste is not of sufficient consequence to be sawn.

All the above are what are commonly denominated edge tools, but there are others required to regulate the forms. All angles whatever are formed by other reversed angles of the same number of degrees as an exterior angle by an interior one, and the contrary. The instrument for trying right angles is called a square, and those for trying oblique angles are called bevels. The two sides which form the edge of a square are always stationary, but those of bevels are generally moveable one leg upon the other round a joint.

In some cases, where a great number of pieces are required to be wrought to the same angle, a stationary bevel, called a joint hook, is used.

When it is required to reduce a piece of stuff to a parallel breadth, an instrument called a gage is used for the purpose. The gage consists generally of a square piece with a square mortise, through which a bar at right angles thereto is fitted and made to slide. The bar, which is called the stem, has a sharp point, cutter, or tooth at one extremity, projecting a little from the surface, so that when the side of the gage, next to the end which has the point, is applied upon the vertical surface of the wood, with the flat side of the stem which has the tooth upon the horizontal surface, and pushed and drawn alternately by the workman from and towards him, the cutter will make an incision from the surface into the wood, at a parallel distance from the upper edge of the vertical side on the right hand. This line, so drawn, will mark out with precision, and shew the superfluous stuff to be taken away.

When a mortise is required to be cut in a piece of wood, a gage with two teeth is used. The construction of this instrument is the same as the common gage; but in addition thereto, the stem has a longitudinal slider with a tooth projecting from the end of the slider, so that the two teeth may be brought nearer, or to any remote distance from each other, at pleasure; and also to any distance, from the face of the head or guide within the reach of the stem.

When wood has been planed, and required to be fawn across the fibres, and as it is necessary to be kept stationary while sawing, in order to prevent the sides or the edges from being bruised, joiners use a flat piece of wood with two projecting knobs on the opposite sides, one at each end, called a side hook. The vertical side of the interior angle of one of the knobs is placed close to the vertical side, and the under side upon the top of the bench; then the wood is pressed against the knob which projects from the upper surface while it is cutting with the saw: but the use of two side hooks is better, as they keep the piece of wood to be fawn more steady.

When it is required to cut a piece of wood to a mitre with one side; that is, to half a right angle, joiners use a trunk of wood with three sides, like a box without ends, or a top, the sides and bottom being parallel pieces, and the sides of equal heights: through each of the opposite sides is cut a kerf in a plane, perpendicular to the bottom, at oblique angles of 45 and 135 degrees, with the planes of the sides; and another kerf is made in the same manner, so as to have its plane at right angles to the former. The trunk thus constructed is called a mitre-box. When the wood is to be cut, the mitre-box is fixed steady against two side hooks, and the piece, which is always less than the interior breadth of the mitre-box, is laid within, and pressed against the farther interior angle of the mitre-box with the side downwards, to which the saw-kerf is intended to be perpendicular, and in this position it is to be cut. The two kerfs in the sides of the mitre-box are requisite, in order to form the acute angle on the right or left-hand side of the piece, as may be required.

When it is required to make a piece of wood straight in one direction, joiners use a slip of wood straightened on one edge, from which the slip of wood itself is called a straight edge. Its use is obvious; by its application it will be seen whether there is a coincidence between the straight edge and the surface.

When it is required to know whether the surface of a piece of wood is in the same plane, joiners use two slips of wood straightened each on one edge with the opposite edge

parallel, and both pieces of the same breadth between the parallel edges: each piece has therefore two straight edges. Suppose it were required to know whether a board is twisted or its surface in a plane, the workman lays one of the slips across the one end, and the other across the other end of the board, with one of the straight edges of each upon the surface; then he looks in the longitudinal direction of the board, over the upper edges of the two slips, until his eye and the two upper edges of the slips are in one plane; or otherwise, the intersection of the plane, passing through the eye and the upper edge of the nearest slip, intersect the upper edge of the farther slip. If it happen as in the former case, the ends of the wood under the slips are in the same plane; but should it happen as in the latter, they are not. In this last case the surface is said to wind; and when the surface is so reduced that every two lines are in one plane, it is said to be out of winding, which implies its being an entire plane: from the use of these slips they are denominated winding sticks.

Before we can proceed to the method of bringing a rough surface to a plane, it will first be necessary to shew how to make a straight edge or ruller.

Here the joiner must not lose sight of the definition of a straight line, viz. a straight line is that which will always coincide with another straight line, however applied together.

The operation of making the edge of a board straight is called by joiners shooting, and the edge so made is said to be shot.

Straight edges may be thus formed; plane the edges of two boards and apply them together, so that the superficies or faces of the boards be in the same plane, and if there be no cavity between the joint the edges will be straight; but if not, the faces must be applied to each other, the edges brought together, and planed and tried as before, until they are found to coincide.

Another mode is by having a plane surface given: plane the edges of a board as straight as the eye will admit of, and apply the face of it to that of the plane, and by the edge of the board draw a line, turn the board over with the other side upon the plane, and bring the planed edge to the line drawn before, and the extremities of the edges to their former places, and draw another line; then if all the parts of this line coincide with the former line, the edge is already straight, but if not, repeat the operation as often as may be found necessary.

Another mode is to plane the edge of a board as straight as the eye will admit of; then plane the edge of another board until it is made to coincide with the former; take a third board and plane the edge of this in like manner, by making it coincide with the edge of the first board; apply the edges of the two last boards together, then if they coincide the operation is at an end, but if not, repeat it as often as may be found necessary.

By any of the methods now shewn, the superficies of the boards, to be shot, are supposed to be parallel planes not very distant from each other; for if the faces be not parallel, or if the thickness be considerable, the operation will be the more liable to error.

To reduce the rough surface of a body to a plane.—This will not be very difficult, when it is known that a plane is that which will every where coincide with a straight line.

The most practical methods are the following: Let the workman provide two winding sticks, and apply them as before directed, making the ends out of winding if they are not found to be so; then if all the parts of the surface are straight on which the edges of the winding sticks were placed,

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placed, it is evident that the whole surface must be plane. If the surface is hollow between the said lines, one of the ends or both must be planed lower, until the surface acquires a small convexity in the length, and then, if straightened between the straight lines at the ends, it will be a perfect plane.

Another mode of forming a plane of the surface is of a quadrilateral form: apply a ruler along the diagonals, then if they are straight they are in a plane, but if they are both hollow, or both round, the surface to be reduced is either concave or convex, and must be straightened in these directions accordingly; and, lastly, if by trying across the diagonals with the straight edge it be found that the one be hollow and the other round, the surface of the board winds. In this case bring down the protuberant part of the convex diagonal, so as to be straight with the two extremities; then straighten the concave diagonal, by planing either of the two ends or both of them, according as the thickness of the board will require. Both diagonals being now straight, traverse the wood, that is, plane it across the fibres, until all the protuberant parts between the diagonals are removed; then the workman may proceed to smooth it by working it in the direction of the fibres.

To join any number of planks together, so as to form a board of a determinate breadth, the fibres of each running longitudinal to those of any other.—Shoot the two edges that are to be joined; turn the sides of the boards towards each other, so that the edges that are shot may be both uppermost; spread these edges over with strong glue of a proper consistence, made very hot; one of the boards being fixed, turn the other upon it, so that the two edges may coincide, and that the faces may be both in the same plane; rub the upper one to and fro in the direction of the fibres till the glue is almost out of the joint; let these dry for a few hours; then proceed to make another joint; continue to join as many boards or planks in the same manner, till the whole intended breadth be made out. If the boards or planks of which the board is to be composed are very long, the edges that are to be united would require to be warmed before a fire; and, for rubbing and keeping the joints fair to each other, three men would be found necessary, one at each extremity, and one at the middle. Boards, glued together with this kind of cement, will stand as long as the substance of the deals or planks composing them, if not exposed to rain or intense heat, provided that the wood has been well seasoned beforehand, and that the grain be free and straight, uninterrupted with few or no knots. When a board which is to be exposed to the weather is to be made of several boards or planks, the cement to be used for uniting them should not be of skin glue, but of white lead ground up with linseed-oil, so thin that the colour may be sensibly changed into a whitish cast: this kind of glue will require a much greater time to dry than skin glue. Boards to be exposed to the weather, when their thickness will admit, are frequently tongued together; that is, the edges of both boards are grooved to an equal distance from the faces, and to an equal depth; and a slip of wood is made to fit the cavity made in both: this slip should be made to fill the grooves, but ought not to be so tight as to prevent the joint from being rubbed with proper cement.

To glue any two boards together forming a given angle.—This may either be accomplished by shooting the edge of the one board to the whole of the given angle, and the face of the other straight; then, by applying these two surfaces together, and rubbing as before, they will form the angle required; or, if the two edges are shot to half the given angle, and the edges applied together and rubbed and

set as before, the faces of the boards will form the angle required. In both these methods, when only one side of the board is to be exposed to sight, which is most commonly the case, pieces of wood called blocks are fitted to the angle, and the sides glued across the joint or legs of the angle, being previously planed for that purpose.

To form wooden architraves for apertures by gluing longitudinal pieces together.—Architraves may be formed out of the solid pieces; but as their formation in this way is attended with a waste of both stuff and time, the most eligible method is to glue the parts longitudinally together, as is best adapted to the nature of the mouldings. Architraves of the Grecian form, for doors and windows, generally consist of one or two faces in parallel planes, the one of which recedes only in a small degree from the other, while the outer edge is terminated with one or several mouldings which have a very prominent projection. In this case make a board of sufficient thickness, and in breadth equal to the breadth of the architrave: prepare a slip of wood of a sufficient thickness and breadth for the mouldings on the outer termination of the architrave; glue this slip upon the face close to the edge of the board, with the outer edge flush therewith. In the operation two men will be at least required to rub the slip to a joint with the board; and as it often happens that the side of the slip, which is to comply with the surface of the board, is considerably bent, the slip is nailed down to the board; but, previously, small square pieces of wood, called buttons, are bored with holes, one in each, and a nail is put through the hole to the head; then the slip is also bored with a brad-awl; and the nails, with the pieces thus described, are entered and driven home as far as the buttons will permit. The buttons may be about three quarters of an inch thick, and the other two dimensions each equal to, or something more than, the breadth of the slip. The slip is sometimes grooved; and the edge of the board is tongued, glued, and inserted in the groove, instead of the above method. Sometimes, also, the two faces are made of different boards tongued together at their joining; then the whole is afterwards stuck into mouldings.

To form the surface of a cylinder with wood, whose fibres are in planes perpendicular to the axis of the cylinder, such as may be used in circular dado, or the soffits of windows.

Method 1.—When the dimension of the cylindric surface, parallel to the axis, is not broader than a plank or board: this may be done by bending and gluing several veneers together; and the first upon a mould or brackets, the edges of which are in the surface of the proposed cylinder parallel to its axis.

This may be accomplished by means of two sets of brackets fixed upon a board with hollow cylindric space between them, of sufficient thickness for taking in the veneers, and double wedges for confining them. If this operation is carefully done, and the glue properly dried, the wedges may be slackened, and the cylindric part so glued up will be found to stand very well; but it must be observed, that, as the wood has a natural tendency to unbend itself, the curve surface, upon which it is glued, should be somewhat quicker than that intended to be made.

Some workmen take another method by forming a hollow cradle, and bending the veneers into it, and confining their ends with wedges, which compress them together; and by a very small degree of rubbing, with a hammer made for this purpose, the glue will be forced out of the joint.

Another method is to form a cradle or templet to the intended surface, and lay a veneer upon it; then glue blocks of

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of wood upon the back of it, closely fitted to its surface, and the other joints to each other, the fibres of the blocks corresponding with those of the veneer.

A third method is to make a cradle and place the veneers upon it, confining one end of them spread in the glue between the veneers with a brush, and fix a bridle across, confining the ends of this bridle either by nails or by screws; open the veneers again, and put in glue a second time between each two, and fix another bridle across them: proceed in this manner to the other extremity.

A fourth method is to run a number of equi-distant grooves across the back of the board at right angles to its edges, leaving only a small thickness towards the face, let this be bent round a cradle or templet made on purpose; and let the grooves be filled with slips of wood, which, after the glue is quite dry, are to be planed down to the surface of the cylindric board, which may be stiffened with canvas glued across the back.

Instead of using a grooving plane, workmen frequently make kerfs with the saw; but this is not so strong when finished, as it is very difficult to insert the slips, and very uncertain as to the depth of each of the kerfs, which will occasion a very unequal bending of the board, if not to a regular depth.

To bend a board, so as to form the frustum of a cone, or any segmental portion of the frustum of a cone, such as the soffit of the head of an aperture.—Find the form of the covering according to the geometrical principles of carpentry; cut out a board to this form, and run a number of equi-distant grooves across it tending to the centre: this being fixed to a templet made to the surface of a cone, proceed and finish it in the same manner as in the last method shewn for a cylinder.

To bend boards so as to form a spheric surface.—Make a mould to the covering of a given portion of the sphere in plano, according to the geometrical principles of carpentry; complete the number of staves by this mould; make a templet or mould to a great circle of the sphere; groove each of the staves across at right angles to a line passing through the middle, and bend it round the templet; put slips in the grooves; lastly, shoot the edges of the staves, so as to be in planes tending to the centre of the sphere: these staves being glued together will form a spheric surface.

To glue up the shaft of a column—Describe two circles of diameters, equal to those of the superior and inferior ends of the shaft.

Circumscribe these by polygons, consisting of the same number of regular sides as the column is to consist of staves.

From the angles draw lines to the centre, which will give the bevels for working the edges of the staves. In this process, after two pieces are glued together, and dried, proceed to glue a third piece in the same manner and so on to the last but one. The last, previous to being glued, the blocks should be fixed upon it, and then the whole may be closed in. N. B. The number of staves should be eight or twelve, otherwise the joint will fall in the middle of the flutes, which should not be in the case. It is a very good method to diminish the staves, previous to their being glued together, as otherwise the waste of stuff would be very great.

To glue up the base of a column in several horizontal courses, or rings, in order to be turned in a lathe.—Consider the number of horizontal or bevel joints, which are best made at the internal angles of mouldings; prepare a board, so as to have a plain surface; let a circle be described on the plane of a

diameter, equal to the diameter of the greatest circle in the height of the course, and circumscribe an equilateral polygon about the circle, with as many sides as there are to be pieces in a course, and from the angles draw lines towards the centre: then any radial line, and one of the adjoining sides of the polygon, will form the angle by which the ends of every two pieces that are to form the course will meet, so as to make their planes coincide. The geometrical part being thus finished, prepare the pieces each in length equal to the side of the polygon, with an acute angle at each end from the outer side, equal to the aforesaid angle on the board, so that each piece will thus have a longer and a shorter side: apply the longer side of each piece to the polygon, the shorter side being next to the centre, so that one of the ends may coincide with a radial; then the other end will also coincide, and thus the whole will meet together, if the work be true. But as this is difficult, it is common to allow the pieces to be a small matter longer, in order to plane them, so as to make close work: for though the methods be true, the workman, though ever so careful, cannot work to geometrical exactness; even the thickness of shaving, or the smallest degree of twist in the board, will spoil the work. Suppose the course completely jointed, take the whole to pieces, and glue the surfaces which are to meet each other, and rub each two adjacent pieces to a joint, until the whole ring or course is firmly closed. When the glue is dry, plane the upper side truly; take the radius of the greatest projecting member in the next course, and describe a circle upon the top of the course, on the same axis with the centre of the lower circle; and with the centre of this circle, in the plane of the top of the course, bisect any one of the arcs comprehended between two adjacent joints; and from the point of bisection, divide the circumference into as many equal parts as there are pieces in the under course, and draw radiating lines towards the centre: join every two nearest points in the circumference, and thus an inscribed polygon will be formed; draw lines to touch the circumference parallel to the sides of the inscribed polygon, and thus a polygon will be made to circumscribe the circle: produce the radiating lines, until they meet the angles of the circumscribing polygon; then the sides of the circumscribing polygon will be the situations of the bottom edge of the vertical outer sides of the second course, and the radiations the situations of the joints. Proceed, as in the first course, to adapt the pieces to their respective situations, making close work: glue each piece to its place on the lower course, and likewise the joints; and when the glue of this course is dry, its upper side may be planed true. Proceed with the uppermost course in the like manner, making the joints fall in the middle of the lengths of the pieces of the lower course; and when finished, the work may be sent to the turner.

To glue up the Ionic and Corinthian capitals for carving.—The abacus must be glued in parts, such that their joints may be in vertical planes. The leaves and caulicoles of the Corinthian capital may be first made of rectangular blocks, and fixed to the vases.

To make a cornice round a cylindric body out of the least quantity of wood, when the body is greater than a half cylinder, and concave, and when the members will nearly touch a right line applied transversely.—Draw a section of the cylinder through its axis, and let the section of the cornice be represented upon the cylindric section. Draw a transverse line touching the two extreme members of the cornice: parallel to this line draw another line within, at such a distance from the former as may be found necessary for thickness of stuff; produce this last line, until it meet the line representing the

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axis of the cylinder. The junction will either be above or below, according as the cornice is applied to the convex or concave sides of the cylinder. This meeting is the centre of two concentric circles, whose radii are the distances between the nearest and farthest extremes of the section of the cornice. This is evidently an application of the method of finding the covering of a cone. When mouldings are got out in this manner, *viz.* by a piece which does not occupy the space, when set to the place represented by the height and breadth, they are said to be sprung.

When a cornice is to have much projection, the corona or middle part is got out of a solid piece, and the parts above and below, or one of them, as may be found necessary, only set to the spring, and supported by brackets.

To describe the various kinds of joinings in the practice of joinery.—Fig. 1. Plate XXII. is a section shewing the most simple method of joining boards, or any kind of framed work together at the angles; this kind of joining is much used in coarse work; it is called lap-joining.

Fig. 2. the method of joining troughs together.

Fig. 3. the method of joining dado together at an internal angle.

Fig. 4. the manner of fixing two pieces of framing together at the angle of their meeting with a returned bead, in order that the joint should be concealed. This is only used in common finishings; in good finishings a bead of $\frac{3}{4}$ ths of an inch broad is generally run close to the joint, and the angle is left entire.

Fig. 5. shews the common method of mitring. This form is always used in mouldings at an external angle, and sometimes also in internal angles: but for internal angles, scribing is to be preferred, when it can be applied, which may always be the case, when there are no quirked mouldings; that is, when mouldings are such that a perpendicular line to the plane of the wall may fall upon any part of them without going through the solid of the moulding.

Fig. 6. is another method of mitring. This may be used in all plane surfaces, at an external angle, but is not applicable to mouldings. This manner of mitring is much more preferable in point of strength to that of fig. 5, in cases where the two can be applied.

Dove-tailing is another mode of joining two plane surfaces together at an angle, by cutting pins of a prismatic form and trapezoidal section on the end of one piece, and notching the end of the other in the same manner, so that the exterior parts of the one is adapted to the indentations of the other, without leaving any cavity when the two sides are brought home to their places. This is the strongest method of joining plane boards; it should always be used in work which may be required to be moved from place to place. There are three sorts of dove-tailing. One kind, called common dove-tailing, shews the ends of the joints: another kind, called lap-dove-tailing, conceals the joints of the dove-tails, but shews a straight joint, not at the angle, but at a small distance parallel to it. The third sort is called mitre dove-tailing, which shews no joint but in the angle. This method is very neat, it is stronger than the straight joint shewn by the section fig. 6, and where both strength and beauty is required it must be preferred to any other. Fig. 7, N^o 1, is a section of common dove-tailing; N^o 2, the side of one of the pieces shewing the pins; N^o 3, shews the ends of the pins; N^o 4, the side of the other piece, shewing the indentations for receiving the pins.

Fig. 8. N^o 1, 2, 3, 4, and 5, different parts of mitre dove-tailing.

To join two pieces of wood together, the fibres of the one run-

ning transversely to the fibres of the other by mortise and tenon or dove-tailing.—One method is by cutting a mortise to a very small depth in the one piece, and a tenon of the same length in the other, and by bolting them together with one or two bolts: where the breadth of the piece having the tenon is considerable, the nuts are to be let in from that side of the tenoned piece which is not exposed to sight; the heads of the bolts upon the mortised piece may be sunk into the wood entirely below the surface, and the cavity may be filled up with a piece of the same kind of wood, neatly fitted in.

Definitions.—1. A frame, in joinery, is the connection of several pieces of timber of an equal thickness, joined transversely to each other, made fast by means of mortises and tenons, leaving rectangular spaces between for other pieces of timber, called panells, each of which is inserted into each edge of the former by means of a groove.

2. Those parts of the frame which terminate the two vertical extremes are called styles.

3. The horizontal parts, which are mortised into the styles, are called rails.

4. If there be any intermediate pieces mortised into the rails, parallel to the styles, such pieces are called muntons.

In framed-work, rails have several epithets, according to their situations; that bordering the framing at the lower extremity is called the bottom rail, that bordering the framing, at the other extremity, is called the top rail. The names of intermediate rails vary according to their number and situation. In doors, that in which the lock is inserted is called the middle, or lock rail; the intermediate rail next to the top rail, is called the frieze rail.

Doors.—A door, in joinery, is a framed piece of timber-work, or boards nailed together, for the purpose of shutting up at pleasure any aperture in a wall or partition, in order to give or prevent passage from one apartment to another.

Plate XXIII. fig. 1, is a four equal-pannelled door: the form is only used in very common work, and is frequently without mouldings.

Fig. 2. is a nine-pannelled door, with square panells at the top. This form is frequently used in street-doors, of which the back is often lined with boards, in the manner of fig. 3, flush with the styles and top rail; the other rails and muntons must therefore be recessed upon one side to receive the boarding.

Fig. 4. is a six equal-pannelled pair of folding-doors, having two panells in the breadth.

Fig. 5. is a double margin, or a pair of folding-doors, with four panells in height, and two in breadth, having lying panells below the top-rail, and above the lock-rail.

Fig. 6. is a ten-pannelled pair of folding-doors, five in height, and two in breadth, having lying panells at the top, bottom, and in the middle, with long panells between them. Of this form is the ancient door of the Pantheon at Rome.

Fig. 7. a sash-door: this form, if not shut with another separate door, should have shifting-shutters, to cover the glass parts, fixed with bolts and nuts. For this purpose, it should at least be one inch and a quarter thicker than a pannelled door in the same place: this gives room for the outside of the shutter to be flush with the styles of the door; but if otherwise, an ugly frame must be patched round the glazed parts, in order to contain the shutter.

Fig. 8. an ancient door, of which form are the windows and door of the temple of Vesta at Rome, and also those of the temple of Eretheus at Athens.

Figs. 9 and 10. are doors of communication, or such as, when open, will not encumber the floor, as other kinds of recessed doors, by jetting into the room, but may either be concealed

concealed entirely within the partition, or folded close to it: they are used for the purpose of making a free communication between one room and another, at great meetings or balls, when any one of the rooms would be insufficient though large enough for common use.

Fig. 9. the elevation of a door to be folded close to the partition, by means of a hanging style, or pilaster, on each side which is first hung to the jamb, then a folding door to each pilaster.

Fig. 10. is a door consisting of four parts: each middle part is hinged to each extreme part; each two parts, on each side, in time of company, may be removed entirely out of the way into hollows on each side of the partition, and guided by grooves at the top and bottom, and made to slide freely upon rollers.

Fig. 11. is a jib-door, that is, such a door as, when shut, may be as much concealed as possible from having the appearance of a door. Jib-doors are used, when only one aperture at the end of the side of a room is necessary; and when it is required to keep the symmetry of that side, without having the appearance of a door; the base, surbase, and paper are, therefore, continued over it as in the other parts of the room, the joint being only seen at the top, and upon the edge opposite the hinge.

JOINING of ISSUE. See ISSUE.

JOINT, the juncture, articulation, or assemblage, of two or more things. See ARTICULATION.

JOINT, in *Anatomy*, the connection of two or more bones to each other: these parts are generally so organized as to admit of motion, but in some instances this is not the case.

The joints or articulations are generally referred to three classes: the immoveable, or *synarthrosis*; the half moveable, or *amphiarthrosis*; and the completely moveable, or *diarthrosis*.

The first of these includes the various kinds of suture; for the description of which, see CRANIUM.

The amphiarthrosis, or joint admitting of slight motion, is made up either of cartilaginous ligaments (*symphyfis*), or of true cartilage (*synchondrosis*). The union of the bodies of the vertebrae to each other, and the articulations of the pelvis, are examples of the former: the connection of the first pair of ribs to the sternum, and of the different bones of the sternum to each other, exemplify the latter.

For the account of the third species, or moveable articulation, see DIARTHROSIS.

A general description of the composition of a joint will be found under the article EXTREMITIES, near the beginning; and in the same article the particular joints of the limbs are described. The account of the articulation of the lower jaw is given under DEGLUTITION; that of the connection of the head to the vertebral column under HEAD. The articulations of the vertebrae are considered in the article SPINE; those of the ribs, in RIBS; and of the pelvis, in PELVIS.

JOINTS, *Diseases of*. Under this head we intend to notice a few cases which belong to the department of *Surgery*, and are not elsewhere treated of in this publication.

Inflammation of Joints.—Idiopathic cases of this kind are not common. The complaint ordinarily originates in consequence of a contusion, sprain, wound, or other kind of injury done to the part affected. Phlegmonous inflammation, wheresoever situated, is uniformly attended with certain local symptoms, by which both its presence and degree may be ascertained. Preternatural redness, increased heat, a throbbing pain, and a tense swelling, affecting the seat of its attack, are the common marks which denote its existence in all situations. When a joint is inflamed, the same local

phenomena are present, and the constitution is disturbed by the usual symptoms of inflammatory fever; but in these cases they are apt to be exceedingly severe. The inflammation attacks the capsular ligaments, and not remaining confined to any particular portion of them, it very quickly diffuses itself universally over their whole extent, as is commonly the case in all inflammations of smooth membranes. That there is this peculiarity in inflammation of membranes, is often strikingly proved in the instance of peritonitis, arising after the operation of lithotomy. Here, we know, that the inflammation commences in the bladder, is communicated to the portion of the peritoneum which covers the fundus and posterior surface of this viscus, and thence rapidly spreads over the whole extent of the abdomen.

The capsules of the joints are naturally endued with little sensibility; but, like the gums, and several other parts in a similar state, they become acutely painful when inflamed. The complaint is accompanied by an increased secretion of the synovia, which becomes of a more aqueous, and of a less albuminous quality than it is in a healthy state. Hence this fluid is not so well calculated for lubricating the articular surfaces and preventing the effects of friction, as it is in the natural condition of the joint. This circumstance may explain why a grating sensation is often perceived on moving the patella when the knee is inflamed.

The capsules of the joints may, as well as other membranes, be thickened by inflammation. At other times an exudation of coagulating lymph may take place upon their internal surfaces; and as, by a general law of the animal economy, the contiguous vessels are always prone to shoot into lymph thus effused upon an inflamed surface, the consequence frequently is, that organized substances, such as pieces of cartilage and bone, are produced in the interior of the joint. The inconveniences of these extraneous bodies, and the mode of relief, will be a subject which we shall presently have to consider.

When the inflammation is more vehement, suppuration may happen within the capsular ligament. Unfortunately, this is by no means an unfrequent occurrence. At length the capsular ligament ulcerates, and purulent matter is effused beneath the integuments. The skin may next ulcerate, so that the abscess is discharged, and the case seems to be somewhat benefited. The openings through which such collections of matter are discharged, will be found, upon examination with a probe, to be the terminations of sinuses leading into the cavity of the joint.

A large joint seldom falls into a state of suppuration, in consequence of acute inflammation, without the constitution being at the same time so disturbed, that life itself is greatly endangered. In the most violent state of the inflammation, or that which is the immediate forerunner of suppuration, the pulse is exceedingly frequent; but not quite so full and strong as it would be if the part affected were of a structure better adapted to resist the ravages of disease. The patient's skin is dry and hot; he is restless and vigilant; and, in very bad cases, delirium and coma may ensue, and end fatally.

But the rapidity with which the common inflammatory fever assumes in such cases the hectic type is a circumstance which must not be passed over in silence. When an abscess has formed in a large joint, in consequence of a severe attack of common inflammation, the patient immediately begins to be affected with hectic symptoms, and the strong action attendant on the inflammatory fever suddenly ceases.

Local consequences, even worse than those above described, may follow inflammation of a joint. As the layer of the capsular ligament reflected over the cartilages of the articulation is often inflamed, the cartilages themselves are very liable

JOINTS.

liable to have the inflammation communicated to them. Parts partaking of a cartilaginous structure being very incapable of bearing the irritation of disease, are often absorbed, so that, in the instance before us, a portion, or the whole of the articular surface of the bones, may be left completely denuded of its natural covering. At length the heads of the bones entering into the formation of the affected joint inflame, and become carious.

Sometimes only such parts as are exterior to the capsular ligament of the joint are inflamed, and in this case the symptoms are never so severe, nor so obstinate, as when the complaint is more deeply situated. Even when suppuration takes place on the outside of the capsule, the case is not dangerous, provided the cavity of the joint be not involved in the inflammatory attacks. Every inflammation of a large joint may generally be considered as a case of considerable importance; yet certainly there are instances where the inflammation being mild in degree, and simple in its nature, the danger is not urgent. However, every surgeon ought to be well impressed with the fact, that though the inflammation be originally of a healthy sort, it is always very likely to be converted into one of a specific nature, whenever there is a tendency in the constitution to scrofulous disease. A person, whose habit is scrofulous, may sometimes continue, during life, exempt from any local diseases of this specific nature, provided he be fortunate enough to avoid all irritation of parts on which scrofula is most particularly disposed to make its attack. Among such parts we must class the joints, especially the knee, hip, elbow, and ankle. Hence, when a joint is inflamed, how mild soever the affections may be, we ought never to forget, that when there is a tendency to scrofula in the system, the original case of simple inflammation is very apt to be the exciting cause of the white swelling, one of the most severe and intractable diseases which increase the catalogue of human miseries. Hence the prudence of adopting with exactness whatever method of treatment may be indicated. In the following observations, we shall suppose the case to be that of an inflamed knee. The means best calculated for the relief of an inflamed joint are, generally speaking, those which are called antiphlogistic. There are few cases in which general and topical bleeding is more necessary and useful. The violence of the inflammation, and the strength, age, and pulse of the patient, must determine with what freedom the lancet should be employed. Leeches, however, may always be applied, and their application be repeated several times with advantage. When the leeches have fallen off, the bleeding is to be promoted by fomenting the part. The surgeon should daily persist in this method, until the acute stage of the inflammation has entirely subsided. In conjunction with this treatment, he should take care to keep the joint continually surrounded with linen wet with the saturnine lotion. In no case of inflammation are the application of cold lotions, and the maintenance of a constant evaporation from the surface of the part affected, more strikingly advantageous.

Fomentations and emollient poultices, however, sometimes afford most ease to the patient, in which circumstance they ought to have the preference.

Together with the foregoing means, laxative and febrifuge medicines are to be exhibited, and in a case of severe pain and loss of sleep, opiates.

When the acute stage of the inflammation has abated, the plan of treatment may be a little altered. The grand object is now to remove the effects which have been left by the preceding affection. These are a thickened state of the capsular ligament, and parts surrounding the articulation; a stiffness of the joint, and pain when it is moved; a collection

of fluid in the capsule, &c. This state of the complaint, when neglected, and there is a tendency to scrofula, may prove exceedingly obstinate, and even terminate in an irremediable specific distemper of the joint. When, therefore, the local redness, tension, and throbbing, and the symptoms of inflammatory fever subside, the activity of the practitioner ought not to be relaxed. The application of a blister to the joint will now be found particularly efficacious, and the discharge should be kept up for a few days with the savin cerase. Very large collections of fluid in the capsular ligament of the knee, great thickening about the joint, and other remaining effects of inflammation, may often, under such treatment, be quite got rid of in a week or ten days.

In other cases, in which the inflammation and its effects are slighter, lotions composed of spirit of wine, vinegar, and sal ammoniac, suffice for the removal of any chronic complaints which may continue after the acute inflammation is at an end.

When the inflammation of a large joint like the knee is induced by a wound, the stomach is often much affected, and the symptoms may be very violent and even fatal.

Of Preternatural Cartilaginous Substances in Joints.—The ancients have either neglected to notice this disease in their writings, or they have not been at all acquainted with it. Ambrose Paré is the first author who mentions it: he had made an incision, in order to discharge some fluid from the cavity of the knee-joint, when a hard, polished, white body, about as large as an almond, was discharged from the wound. (Livre 25. chap. 15.) Since the time of Paré, the complaint has been described by numerous surgical authors; but the most valuable information on the subject may be found in the works of Reimarus, Morgagni, Bromfield, Ford, Default, Home, Hey, and Abernethy.

The external part of the extraneous substances, to which allusion has been made, is in general of a cartilaginous consistence, while their central part is frequently osseous. Their figure is subject to great variety; but they usually have one concave side, and another which is convex. They are, for the most part, formed in the knee, and have been supposed by Reimarus, and a few other writers, to be met with in no other articulation. Morgagni, however, has seen ossified bodies of this kind in the ankle-joint. Haller, also, discovered a great number of cartilaginous bodies in the articulation of the jaw, where the natural cartilages had been destroyed. Mr. Hey, of Leeds, mentions a case, in which there were two bodies of this description in the elbow-joint. The largest preternatural cartilage perhaps ever met with is mentioned by Mr. Home, as being nearly equal in size to the knee-pan itself, and situated in the knee-joint of a soldier, belonging to the 56th regiment. The greatest number ever known to be contained in one articulation is twenty-five. In most instances, we only find one.

These preternatural cartilaginous substances are either attached to some part of the inside of the joint, or they are quite unconnected, loose, and moveable. It is only when they become so situated, as to interpose themselves between two articular surfaces, which glide over each other in the motion of a limb, that much inconvenience commonly results from their presence. While they continue by the side of the patella they cause but little trouble; but when they slip under the ligament of that bone, or between the same bone and the condyles of the femur, or between the latter bone and the head of the tibia, then they impede progression, cause considerable pain, and often excite inflammation.

Much light was thrown upon the formation of loose cartilaginous tumours in the joints, by the penetrating genius of the

the late Mr. Hunter. It was his belief, that a coagulum of extravasated blood might, under certain circumstances, be converted into an organized vascular substance, by the vessels growing into it from the neighbouring living surface. No one doubts that the coagulating lymph has constantly a tendency to become vascular, when effused on the surface of an inflamed membrane. Now, if we take the trouble of perusing the cases which are related by different authors, we shall find, that the formation of loose cartilaginous substances in the joints, has generally been preceded by violence done to the part, and by symptoms of inflammation. Of this description are the examples published by Mr. Ford, M. Brochier in *Default's Journal*, Mr. Abernethy, and Mr. Hey. Latta mentions four instances which were preceded by rheumatism. In this state, we conceive that the capsular ligament, or its delicate layer, reflected over the articular cartilages, effuses coagulating lymph upon a part of its surface; that such lymph soon becomes vascular and organized; and that it gradually assumes a structure more or less like that of cartilage.

Loose preternatural cartilages are mostly attached to some part of the articular cavity, which does not suffer attrition when the joint is moved. Dr. Alexander Monroe, in dissecting the knee of a malefactor, found in the joint an osseous tumour, which was connected by a ligamentous pedicle with the exterior edge of the cartilage covering the external cavity of the tibia. (*Edin. Essays*, vol. iv. p. 245.) Perfect quietude is essential to the growth of new vessels into coagulating lymph, and in the case just now quoted, if the exudation had taken place, where it would soon have been disturbed in the motion of the limb, its organization could scarcely have happened. Also, if such cartilaginous bodies were to be commonly formed on a part of the articular cavity, necessarily exposed to friction in walking, &c. then patients would experience pain from the first. But, as they do not feel inconvenience till the tumour has become very moveable by the gradual elongation, or sudden rupture of its pedicle, and only then when the tumour glides into a situation where it is pinched between the articular surfaces, we have a right to conclude, that most cartilaginous bodies of this kind grow originally in a situation, where they are not particularly exposed to disturbance in the motion of the joint. In most instances, the communication of vascularity must also happen, during the tenderness of the joint, at which period the patient naturally keeps his limb in a quiet state, in order to avoid pain. After all inflammation has subsided, the limb is again moved with freedom; the organized coagulum is gradually loosened by the motion, and at length it only remains connected with the joint to which it was originally attached, by means of a long slender pedicle, through which its nutrient vessels proceed. At last the pedicle breaks, and the cartilaginous substance is left quite loose, like an extraneous body, in the cavity of the joint.

The irritation of loose cartilages in the knee often occasions an increased quantity of fluid in the capsular ligament, but this is not invariably the case. When the irritation is such as to induce a degree of heat and tenderness in the joint, there is usually a preternatural quantity of the synovia secreted: when pain and inconvenience have not lately been felt, this fluid is generally not more abundant, than in the natural state of the joint.

With respect to the treatment of these cases, we are not acquainted with any certain means of freeing the patient from the inconveniences of the disease, if we except making an incision into the joint, for the purpose of extracting the cartilaginous substance. To this plan, the danger attendant on all wounds of so large an articulation as the knee is a very

serious objection. Hence, Middleton and Gooch tried another method, which was to conduct the extraneous body into a situation where it produced no pain, and to retain it in that position a long time, by means of bandages, under the idea, that the cartilaginous substance would adhere to the contiguous parts, and occasion no future trouble. These surgeons appear at least to have thus afforded temporary relief.

Mr. Hey, impressed with a just sense of the dangerous symptoms, which have occasionally resulted from the most simple wounds penetrating the knee-joint, tried the efficacy of a laced knee-cap, and the cases which he has adduced clearly demonstrate, that the benefit thus obtained is not transient, at least as long as the patient continues to wear the bandage. In one case, the method had been tried, for ten years, with all the success which the patient could desire.

All things considered, it is our decided opinion, that the effect of a knee-cap, or of a compress and roller, ought generally to be tried before having recourse to the knife, supposing the cartilaginous substance can be placed in a situation where it gives no pain, and admits of being compressed. But doubtless there are instances, in which it is the duty of the surgeon to operate. If a man be deprived of his livelihood by not being able to use his knee; if he cannot, or will not, take the trouble of wearing a bandage; if he be urgently desirous of running the risk of the operation, after circumstances have been impartially explained to him; if a bandage fail in affording sufficient relief; and lastly, if excessive pain, severe inflammation of the joint, and lameness, be frequently brought on by the disease; the employment of the knife seems justifiable and proper. It is very certain, that success has generally attended the operation; but small as the hazard may be of losing the limb, and even life, in the attempt to get rid of the complaint; yet, since the inconveniences of the disease are in most cases very bearable, and are also capable of palliation by means of a bandage, endangering the limb and life in any degree must appear to many persons contrary to the dictates of prudence.

We have no instance recorded, where there was a necessity for removing a cartilaginous tumour from any joint but the knee.

The disease being often attended with a degree of heat and tenderness about the joint, there can exist no doubt of the propriety of keeping the patient in bed a day or two before he submits to the operation, the danger of which is in a great measure proportioned to the subsequent inflammation. When the attempt to heal the wound by the first intention succeeds, much of the hazard is also past. Therefore, the joint should be brought into as quiet a state as possible before the incision is practised, and besides a little confinement, the surgeon should direct leeches and cold saturnine lotions to be applied to the knee, and an opening draught or two to be taken.

As the loose piece of cartilage may, in general, be moved round the joint, the surgeon frequently has it in his power to choose the place where he will make the incision. Ford, Latta, and others have made the wound on the outside of the joint. Default used to bring the loose cartilage to the inner side of the articulation, against the attachment of the capsular ligament, and then make the cut in that situation. Mr. Abernethy has recommended bringing the extraneous substance to the outside of the internal condyle of the os femoris, and dividing the capsular ligament at that part. Mr. Russell advises us to push the moveable body upwards, on the inside of the thigh, in order that the incision may be as distant as possible from the moving surface of the joint, Mr. Hunter also preferred removing these loose bodies at the

upper part of the joint, because there the bag, which contains the synovia, has less of the nature of a capsular ligament.

But whatever place may be chosen for the incision, it is of great consequence that an assistant prevent the loose cartilage from slipping away, lest it should not easily be found again, and the purpose of the operation be frustrated. It is clear, that if the capsular ligament were wounded when an accident of this kind occurred, the patient would be exposed to all the danger of the operation, without any chance of being benefited by it.

All operators have followed the plan of drawing the integuments to one side before making the incision, so that as soon as the excision of the cartilage is accomplished, the wound in the capsular ligament may become immediately covered with skin. Thus the bad effects of the cavity of the joint being exposed, are materially prevented. The piece of cartilage, when brought into view, is to be directly extracted by means of a tenaculum.

The skin is then to be brought over the opening in the capsular ligament; the external wound is to be closed with sticking plaster; cold lotions are to be applied to the knee; and every antiphlogistic measure adopted, which may seem prudent and necessary.

Experience has further proved, that the patient is not completely out of danger as soon as the wound is united; and that he ought, for some time longer, to keep the limb at rest. See Bromfield's *Chirurgical Cases and Observations*, vol. i. p. 335, 336.

Of Hydrops Articulæ, or Dropsy of the Joints.—This disease consists of an accumulation of water in the capsular ligament of a joint, and is very analogous to the hydrocele, or collection of an aqueous fluid in the tunica vaginalis testis. Both these complaints, indeed, are alike, in not arising from a general dropsical affection of the constitution, the patient being frequently in other respects quite sound. There are, it is true, a few exceptions to the latter part of this observation. The knee is, of all joints, the most liable to the disease, perhaps on account of the largeness and looseness of its capsular ligament.

The precise causes of hydrops articuli are often beyond the reach of investigation. The disorder, however, is frequently preceded by severe rheumatic affections, fevers, and local violence. In most cases a fluctuation is very distinguishable, unless the joint be uncommonly distended. When the limb, also, is extended, so as to relax the extensor muscles of the leg, the knee-pan may be made to rise up, by pressing the tumour, and a fulness may then be discerned on each side of that bone. The complaint is in general unattended with serious pain, though some uneasiness, and a sense of stiffness are experienced.

In considering the treatment of this, as well as of most other diseases, it behoves us to pay especial attention to the causes where they are discoverable, the mere removal of them being often of itself capable of effecting a cure. Thus, when hydrops articuli occurs during the debility consequent to typhoid and other fevers, the complaint can hardly be expected to get well till the strength of the constitution is, in some degree restored. The connection between the local and constitutional disorder is well illustrated in a case which Mr. Ralléll has related, and in which every local remedy was tried without avail: the disease, which would not yield as long as the debility consequent to a typhus fever lasted, got well spontaneously immediately when the patient regained his strength. On *Morbid Affections of the Knee*, p. 192.

In ordinary examples hydrops articuli is quite a local malady, unconnected with any disorder of the constitution, and

may be dispersed by topical treatment. One of the most effectual means for this purpose, is the application of a blister, which should be kept open with the favin cerate. The operation of the blister may also be very materially promoted by the pressure of a bandage. In some instances the action of the absorbents may be sufficiently excited by moderate exercise, and frictions with flannel impregnated with the steam of vinegar, or by electricity, and rubbing the joint with camphorated mercurial ointment. The patient should likewise be purged with calomel, or kali acetatum, unless any particular reasons forbid.

Surgical writers inform us of cases, which resist common treatment, are attended with immoderate distention, and even with such irritation upon a weak constitution, as seriously impairs the health. Here, the surgeon would be justified in making a small puncture into the joint, in order to discharge the fluid. Care should be taken to make the opening no larger than necessary, and to draw the integuments to one side, before introducing the lancet, or trocar, so that the wound in the capsular ligament, as soon as the operation is finished, may become covered with skin.

Excision of Diseased Joints.—In the year 1782, Mr. Park, a surgeon at Liverpool, made the proposal of totally extirpating many diseased joints, so as to do away the necessity of cutting off limbs, which might still be of more use to the patients than any artificial contrivance. It was his plan to effect an entire removal of the heads of such bones as composed the diseased articulation, and then to make the sawn extremities of the bones grow together, like the ends of a fracture.

After undertaking some experiments upon the dead subject, Mr. Park, in 1781, performed the operation of extirpating the diseased knee of a strong robust sailor, aged 33. The method pursued was much like that which had been previously tried upon the dead subject, and which was as follows: An incision began about two inches above the upper end of the patella, and extended about as far below its lower part. Another one was made across this at right angles, immediately over the patella, down to the bone, and nearly half round the limb, the leg being in an extended state. The lower angles, formed by these incisions, were raised, so as to lay bare the capsular ligament; the patella was then taken out; the upper angles were raised, so as fairly to denude the head of the femur, and to allow a small catling to be passed across the posterior flat part of the bone, immediately above the condyles, care being taken to keep one of the flat sides of the point of the instrument quite close to the bone all the way. The catling being withdrawn, an elastic spatula was introduced into its place, for the purpose of protecting the soft parts during the sawing of the thigh-bone. The head of the bone, thus separated, was carefully dissected out; the head of the tibia was then easily turned out and sawn off, and as much as possible of the capsular ligament dissected away. The quantity of bone removed in the operation was a very little more than two inches of the thigh-bone, and rather more than one inch of the tibia. The only large artery divided was one on the front of the knee, and it ceased to bleed before the operation was concluded; but the ends of the bones bled very freely. To keep the redundant integuments from falling inwards, and the edges of the wounds in tolerable contact, a few sutures were used. The dressings were light and superficial, and the limb was put in a tin case, which was long enough to receive the whole member, from the ankle to the trochanter major.

We learn from Mr. Park, that afterwards many troublesome circumstances occurred, arising chiefly from the difficulty,

culty of keeping the limb in a fixed position, the great depth of the wound, and the abscesses and sinuses which were formed in the part. The first symptoms, however, were not at all dangerous. But the patient was obliged to keep his bed nine or ten weeks, and it was many months before the cure was complete. The man afterwards went to sea, and so useful was his limb, that he was able to do his duty extremely well.

Mr. Park made another attempt to extirpate a diseased knee, but it was less favourable, as the patient lingered a few months after the operation, and died.

About the same time that Mr. Park made his proposal, a similar plan was suggested by P. F. Moreau, a French surgeon, and tried in several instances, upon the knee, elbow, &c. by himself and his son.

The excision of diseased joints seems, at present, to have no advocates among surgeons of judgment and experience. A full relation of all that is known on the subject has been lately published by Dr. Jeffreys, in a work entitled "Cases of the Excision of Carious Joints." In this book may be found a description of a very ingenious saw for facilitating the operation. The instrument is constructed with joints, like a watch chain, so as to allow itself to be drawn behind a bone with a crooked needle, and be calculated for cutting the bone from behind forwards, without injuring the soft parts. It was made by Mr. Richards, who was assisted by his nephew, the present Mr. Richards, of Brick Lane, London. In placing the saw under the bone, its cutting edge is to be turned away from the flesh. Handles are afterwards hooked on the instrument.

The reasons which keep the practice of cutting out diseased joints from being imitated, are, in our opinion, of the most invincible kind. We believe that it is only right to amputate a limb, on account of a diseased joint, when the patient's health is so reduced, that it cannot any longer bear the irritation of the local disease, and that as long as the strength holds out, the propriety of endeavouring to cure the disease, and preserve the limb, is dictated by every principle of good surgery, as well as humanity. If it be only in hopeless circumstances, and in a reduced state of the patient, that we are to turn our minds to the use of the knife, it seems improbable that a patient, after being greatly reduced by hectic symptoms, would in general recover from so bold and terrible an operation, as that of dissecting away the whole of the knee-joint. If some few should escape with life and limb preserved, would the bulk of persons treated in this manner have the same good fortune?

The extirpation of so large an articulation as the knee cannot be compared with the operation of amputation, in point of simplicity and safety. The chief objections are founded, however, not upon the pain, nor difficulty of the operation, but upon the great length of time which the healing of the wound requires, and which, in the first case recorded by Mr. Park, was no less than eight months. His second example, as we have already mentioned, ended fatally. Moreau's patient, though much debilitated, escaped the first dangers consequent to the operation; and "after three months confinement, the patient was in such a state, that Moreau expected he would be able to walk upon crutches in another month or six weeks!" In the mean time the young man died of a dysentery. Allowing the excision of the knee to be followed by all possible success, few men of judgment will also acknowledge, that the advantage of having a mutilated, shortened, stiff limb, instead of a wooden leg, is an adequate compensation for the more painful operation that has been endured, and the greater risk that has been run.

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Many of the foregoing observations were originally published in a Treatise on the Diseases of the Joints by S. Cooper, 1807.

JOINTS, in *Mining*, are applied to the vertical fissures, or cutters, by which most of the strata are divided nearly vertically, into separate blocks and pieces. In the limestone quarries in Derbyshire, two very distinct kinds of joints are noticed in the rock, some that are peculiar to the particular beds of stone, (the fissures of W. Martin,) and rarely sink through more than two or three beds; and others, that break through all the beds of limestone, and form a perfectly straight wall often to the face of their quarries; these last seem perfectly allied to mineral veins, though often not more than the eighth, or a quarter of an inch wide, and have their sides skirted with fluor, or calcareous spar, or barytes, and are polished, or shew thicker sides in some instances, and often these joints contain small specks of lead ore; while it is very rare for the other, or partial joints, to contain spar or ore; these kinds of joints, when close filled with spar, so as to cement the parts of the rock firmly together again, seem to answer to the contemporaneous veins of Werner; and the spar-joints of other writers; Mr. William Martin calls them rifts, *Outlines*, p. 171. Quarrymen sometimes apply the term *joint* to the partings or thin way-boards which separate the different thin strata or beds of stone in a rock; but properly, these are called bed-joints, or strata-seams. The definition which M. Werner gives of strata, viz. "those parts of a rock which lie between parallel rents and fissures," (*Transl. of New Theory of Veins*, p. 2.), is much too general, as it may include both the kinds of joints above-mentioned, and the impropriety also is striking, of applying the term *rent* to the bed-joints of a rock, or semi-strata of Martin; with such vague ideas as these, it is no wonder that many observers have mistaken the cutters or joints of thick strata, that happen to range parallel, for bed-joints or strata-seams, and described strata as vertical, which are in reality horizontal, or near it.

JOINTS, in *Architecture*, denote the separations between the stones; which are filled with mortar, plaster, or cement.

JOINT, in *Carpentry*, &c. is applied to several manners of assembling, or fitting, pieces of wood together. Thus we say, a dove-tail joint, &c. See JOINERY, MORTISE, DOVE-TAIL, &c.

JOINT, *Universal*, in *Mechanics*, an excellent invention of Dr. Hook, adapted to all kinds of motions and flexures; of which he has given a large account in his *Cutlerian Lectures*, printed in 1678. This seems to have given occasion to the gimbois used in suspending the sea-compass, the mechanism of which is the same with that of Desaguliers's rolling lamp.

JOINT, in *Ship Building*, a term signifying the juncture of the frame-timbers, which is represented by a line, whereby the shape of the vessel is determined at the stations of the frames, to which the moulds are made for forming the various timbers, and although the frame is composed of a double set of timbers, yet they are generally close enough that the mould, made at the joint or middle, gives the shape of the fore-side of the one, and the aft-side of the other.

JOINT *Action*, in *Law*. In personal actions several wrongs may be joined in one writ; but actions founded upon a tort, and on a contract, cannot be joined; for they require different pleas and different process.

JOINT-battery. See BATTERY.

JOINT-executors, in *Law*, are two or more persons appointed such by will: in which case they are accounted but as one single person, so that the actions done by one of them

are taken to be the acts of all, because they all represent the person of the testator; thus, where two joint-executors are possessed of a lease for years, in right of their testator, one of them may sell the term without the other's joining; and in like manner, where one joint-executor gives a release, the others are bound by it, each having an authority over the whole estate; but a joint-executor is not charged with the acts of his companion, any farther than he is actually possessed of the goods of the testator: however, if joint-executors enter into an agreement, that each shall intermeddle with particular parts of the testator's estate, in that case each becomes chargeable for the whole by agreement. It has been held, that two joint-executors cannot urge separate pleas, because their testator, if living, on an action brought against him, could have been allowed but one plea; and that, if all the executors are not named in any action brought by joint-executors, the action will abate. As to legatees, the receipt of one executor charges not the other. See EXECUTOR.

JOINT-lives, denote lives that continue during the same time, or that exist together. See **LIFE-annuities**.

JOINT-rule. See *Carpenters' joint RULE*.

JOINT-TENANCY, in *Law*, see the next article.

JOINTENANTS, or **JOINT-TENANTS**, in *Law*, those who come to, and hold, lands and tenements by one title *pro indiviso*, or without partition.

These are distinguished from *sole*, or several-tenants, from *parceners* and from *tenants in common*. Anciently they were called *participes*, and not *heredes*. See **SEVERALTY**.

An estate in joint-tenancy is where lands or tenements are granted to two or more persons to hold in fee-simple, fee-tail, for life, for years, or at will. This is sometimes called an estate in "jointure," which word, as well as the other, signifies an union or conjunction of interest. The "creation" of an estate of this kind depends upon the wording of the deed or devise by which the tenants claim title; for this estate can only arise by purchase or grant, that is, by the act of the parties, and never by the mere act of the law. Now, if an estate be given to a plurality of persons, without adding any restrictive, exclusive, or explanatory words, as if an estate be granted to A and B and their heirs, this makes them immediately joint-tenants in fee of the lands. For the law interprets the grant so as to make all parts of it take effect, which can only be done by creating an estate in them both. As, therefore, the grantor has thus united their names, the law gives them a thorough union in all other respects. The "properties" of a joint estate are derived from its unity; and this unity is fourfold; *viz.* the unity of interest, the unity of title, the unity of time, and the unity of possession; or in other words, joint-tenants have one and the same interest, accruing by one and the same conveyance, commencing at one and the same time, and held by one and the same undivided possession. With regard to unity of *interest*, it may be observed, that one joint-tenant cannot be entitled to one period of duration, or quantity of interest in lands, and the other to a different; one cannot be tenant for life, and the other for years; one cannot be tenant in fee, and the other in tail. (Co. Litt. 188.) But if land be limited to A and B for their lives, this makes them joint-tenants of the freehold; if to A and B and their heirs, it makes them joint-tenants of the inheritance. (Litt. § 277.) If land be granted to A and B for their lives, and to the heirs of A; here A and B are joint-tenants of the freehold during their respective lives, and A has the remainder of the fee in severalty; or, if land be given to A and B, and the heirs of the body of A; here both have a joint estate for life, and A hath a several re-

mainder in tail. (Litt. § 285.) Joint-tenants must also have an unity of *title*; their estate must be created by one and the same act, whether legal or illegal; as by one and the same grant, or by one and the same disseisin. (Litt. § 278.) Joint-tenancy cannot arise by descent or act of law; but merely by purchase, or acquisition by the act of the party; and, unless that act be one and the same, the two tenants would have different titles; and if they had different titles, one might prove good, and the other bad, which would absolutely destroy the jointure. There must also be an unity of *time*; their estates must be vested at one and the same period, as well as by one and the same title. As in case of a present estate made to A and B; or a remainder in fee to A and B after a particular estate; in either case A and B are joint-tenants of this present estate, or this vested remainder. But if, after a lease for life, the remainder be limited to the heirs of A and B; and during the continuance of the particular estate A dies, which vests the remainder of one moiety in his heir; and then B dies, whereby the other moiety becomes vested in the heir of B; now A's heir and B's heir are not joint-tenants of this remainder, but tenants in common; for one moiety vested at one time, and the other moiety vested at another. (Co. Litt. 188.) Moreover, in joint-tenancy there must be an unity of *possession*. Joint-tenants are said to be seised "per my et per tout," by the half or moiety, and by all; that is, they each of them have the entire possession, as well of every *parcel* as of the *whole*. (Litt. § 288. 5 Rep. 10.) And therefore, if an estate in fee be given to a man and his wife, they are neither properly joint-tenants, nor tenants in common: for husband and wife being considered as one person in law, they cannot take the estate by moieties, but both are seised of the entirety, "per tout et non per my;" the consequence of which is, that neither the husband nor the wife can dispose of any part without the assent of the other, but the whole must remain to the survivor. (Litt. § 665. Co. Litt. 187. 2 Vern. 120. 2 Lev. 39.) From these principles we may deduce other incidents pertaining to the joint-tenant's estate. If two joint-tenants let a verbal lease of their land, reserving rent to be paid to one of them, it shall enure to both, in respect of the joint-reversion. (Co. Litt. 214.) If their lessee surrenders his lease to one of them, it shall also enure to both, because of the privity or relation of their estate. (Co. Litt. 192.) For the same reason, livery of seisin, made to one joint-tenant, shall enure to both of them (Co. Litt. 49.); and the entry, or re-entry, of one joint-tenant, is as effectual in law as if it were the act of both. (Co. Litt. 319. 364.) In all actions, also, relating to their joint-estate, one joint-tenant cannot sue or be sued without joining the other. (Co. Litt. 195.) But if two or more joint-tenants be seised of an advowson, and they present different clerks, the bishop may refuse to admit either: because neither joint-tenant hath a several right of patronage, but each is seised of the whole; and if they do not both agree within six months, the right of presentation shall lapse. But the ordinary may, if he pleases, admit a clerk presented by either, that divine service may be regularly performed; and if the clerk of one joint-tenant be so admitted, this shall keep up the title in both of them. (Co. Litt. 185.) It is held also, that one joint-tenant cannot have an action against another for trespass, in respect of his land (3 Leon. 262.); for each has an equal right to enter on any part of it. But one joint-tenant is not capable by himself of doing any act which may tend to defeat or injure the estate of the other, as to let leases, or grant copy-holds (1 Leon. 234.); and if any waste be done, which tends to the destruction of the inheritance, one joint-tenant may have an action of waste against

against the other, by construction of the statute Westm. 2. c. 22. (2 Inst. 403.) So likewise, though at common law no action of account lay for one tenant against another, unless he had constituted him his bailiff or receiver (Co. Litt. 200.); yet now by the statute 4 Anne, c. 16. joint-tenants may have actions of account against each other, for receiving more than their due share of the profits of the tenements held in joint-tenancy. From the same principle also arises the remaining grand incident of joint estates; viz. the doctrine of *survivorship*; which see.

An estate in joint-tenancy may be *severed* and *destroyed*, by destroying any of its constituent unities. The first, indeed, cannot be effected by any subsequent transaction. But the joint-tenant's estate may be destroyed without any alienation, by merely disuniting their *possession*. Hence, if two joint-tenants agree to part their lands, and hold them in severalty, they are no longer joint-tenants, and the right of survivorship is by such separation destroyed. (Co. Litt. 188. 193.) By common law all the joint-tenants might agree to make partition of the lands; but one of them could not compel the other so to do (Litt. § 290.); but now by the statutes 31 Hen. VIII. c. 1. and 32 Hen. VIII. c. 32. joint-tenants, either of inheritance or other less estates, are compellable by writ of partition to divide their lands. Again, the jointure may be destroyed by destroying the unity of *title*. As if one joint-tenant alienes and conveys his estate to a third person, the joint-tenancy is severed, and turned into tenancy in common. (Litt. § 292.) But a devise of one's share by will is no severance of the jointure; for no testament takes effect till after the death of the testator, and by such death the right of the survivor, which accrued at the original creation of the estate, and has therefore a priority to the other, is already vested. (Litt. § 287.) It may be also destroyed by destroying the unity of *interest*. And therefore, if there be two joint-tenants for life, and the inheritance is purchased by or descends upon another, it is a severance of the jointure. (Cro. Eliz. 470.) In like manner, if a joint tenant in fee makes a lease for life of his share, this defeats the jointure, for it destroys the unity both of title and interest. (Litt. § 302, 303.) And whenever, or by whatever means the jointure ceases or is severed, the right of survivorship the same instant ceases with it. (Co. Litt. 108.) Yet, if one of these joint-tenants alienes his share, the two remaining tenants still hold their parts by joint-tenancy and survivorship (Litt. § 294.); and if one of three of these joint-tenants releases his share to one of his companions, though the joint-tenancy is destroyed with regard to that part, yet the two remaining parts are still held in jointure (Litt. § 304.); for they still preserve their original constituent unities.

Things personal may belong to their owners, not only in severalty, but also in joint-tenancy, and in common as well as real estates. Thus if a house, or other personal chattel, be given to two or more absolutely, they are joint-tenants of it; and, unless the jointure be severed, the same doctrine of survivorship shall take place as in estates of lands and tenements. (Litt. § 282. 1 Vern. 482.) The king cannot have a joint property with any person in one entire chattel, or such a one as is not capable of division or separation; but where the titles of a king and a subject concur, the king shall have the whole. Blackst. Com. b. ii.

JOINT-water, a term used by our farriers, for what the old writers in medicine have called *hyarthros*; a running of a clear ichor from the joints, when they are either wounded or ulcerated; it is common in diseases of horses.

JOINTEE, in the *Manege*. See *HANDFUL*.

JOINTRESS, or *JOINTERESS*, she that hath an estate

settled upon her by her husband, to hold during her life, if she survives him.

JOINTURE, in *Law*, a covenant whereby the husband, or some friend in his behalf, makes over to his wife, on condition of marriage, certain lands and tenements for the term of her life, or otherwise, in lieu of dower.

Others define jointure a bargain and contract of livelihood, adjoined to the contract of marriage, being a competent provision of freehold lands or tenements, &c. for the wife, during her life at least, to take effect in profit or possession, after the death of her husband, if she herself is not the cause of the extermination or forfeiture of it.

And to make a perfect jointure within the statute of 27 Hen. VIII. c. 10. to bar dower, several things are to be observed. 1. It must be made to take effect for the life of the wife in possession or profit, presently after the decease of her husband. 2. It must be for the term of her own life, or a greater estate; but it may be limited to continue no longer than she remains a widow, &c. 3. It must be made for herself, and to none other in trust for her. 4. It is to be expressed to be in satisfaction of her whole dower, and not a part of it. 5. It may be made before or after marriage: if it be made before, the wife cannot waive it, and claim her dower at common law (4 Rep. 1, 2.); but if it be made after marriage, she has her election, after the husband's death, and may either accept it, or refuse it, and betake herself to her dower at common law; for she was not capable of consenting to it during coverture, unless the jointure be made by act of parliament. After the death of her husband, the wife may enter into her jointure, and is not driven to a real action, as she is to recover dower by the common law; and upon a lawful eviction of her jointure, she shall be endowed according to the rate of her husband's lands, whereof she was dowable at common law.

A wife's jointure shall not be forfeited by the treason of the husband (Co. Litt. 37.); but feme-coverts, committing treason or felony, may forfeit their jointures, and being convicted of recusancy, they shall forfeit two parts in three of their jointures and dower, by 3 Jac. I. c. 4.

JOINVILLE, JOHN SIRE DE, in *Biography*, a French historian, born in the early part of the thirteenth century, made a considerable figure in the court of Lewis IX. This prince he followed in all his military expeditions, and assisted him also in the administration of justice. One of the duties which he had to perform, was to hear the pleas of applicants at the palace gate, and to report them to his majesty, and also to investigate the truth of the allegations. When Lewis took the cross, and made his expedition into Egypt in 1249, Joinville, instigated by the martial spirit and devotion of the age, attended him with a train of followers suited to his rank, and his narrative of this enterprize in his life of Lewis, is one of the most curious and valuable records of that age. The historian shared his sovereign's captivity, as well as the dangers which they all incurred from the common enemy. He returned in safety, and was so much impressed with the danger and impolicy of these expeditions, that he made no scruple of condemning those who advised Lewis to undertake his second crusade, and excused himself from accompanying the king, on the pretext of having been ruined by the first. Joinville's history was completed in the year 1309, when the author, according to Gibbon, must have been more than ninety years of age; it is a faithful detail of the facts which occurred under his own observation. "A monkish historian should have been content to applaud the most despicable part of his (the king's) character; but the noble and gallant Joinville, who shared the friendships

and captivity of Lewis, has traced with the pencil of nature the free portrait of his virtues as well of his failings." The most valuable edition of this work is that of Du Cange in 1688; but the text of the Paris edition in 1761 is reckoned the most pure and authentic. It has been lately translated into the English, and published by Mr. Johnes of Hafod. Moreri, Gibbon.

JOINVILLE, in *Geography*, a town of France, in the department of the Upper Marne, and chief place of a canton, in the district of Wassy, situated on the Marne; 15 miles S.E. of St. Dizier. The place contains 3086, and the canton 7476 inhabitants, on a territory of 145 kilometres, in 15 communes. N. lat. $48^{\circ} 27'$. E. long. $5^{\circ} 13'$.

JOIRE, St., a town of France, in the department of Mont Blanc; 4 miles S.E. of Chambéry.—Also, a town in the same department; 15 miles S.E. of Geneva.

JOISTS, or JOYSTS, in *Architecture*, those pieces of timber framed into the girders and summers on which the boards of floors are laid.

Joists are from six to eight inches square, and ought seldom to lie at a greater distance from each other than ten or twelve inches; nor ought they ever to bear at a greater length than ten feet; or to lie less into the wall than eight inches. See CHIMNEY.

Sometimes the carpenters fix their joists, as they call it; that is, they lay two rows of joists, one over the other.

JOKALAY, in *Geography*, a town of Sweden, in the government of Abo; 22 miles N.W. of Abo.

JOKES. See JESTING.

JOKI, in *Geography*, a town of Japan, in the island of Nippon; 50 miles N. of Meaco.

JOKIOS, a town of Sweden, in the province of Tavastland; 28 miles W.S.W. of Tavasthus.

JOKKAS, a town of Sweden, in the province of Tavastland; 107 miles N.E. of Tavasthus.

JOKKATO, a town of Africa, in the kingdom of Barra.

JOKO, a town of Africa, in Kaarta. N. lat. $14^{\circ} 30'$. W. long. 8° .

JOKOMI, a town of Japan, in the island of Nippon; 25 miles N. of Jedo.

JOLCOS, or, as Homer calls it, *Juolcos*, in *Ancient Geography*, a town of Thessaly, in Magnesia, at the lower extremity of the Pelasgic gulf, seven stadia from Demetrias and the sea. It was anciently considerable, and had a famous port. Pliny says that Adraсте at this place invented the funeral games; and Strabo reckons it in the number of those towns which were destroyed in order to people the town of Demetrias. Jason, the son of Eson, was king of Jolcos, and from hence the Argonauts took their departure; and it is said that on their return they found the town in the possession of Pelias, brother of Jason, who had him put to death.

JOLIAN, in *Geography*, a town of Hindoostan, in Guzerat; 20 miles N. of Gogo.

JOLIBA, denoting, in the language of the Negroes, "great water," is a name which they give to the river Niger, called by the Moors "Nil il Abud," or the river of Slaves. When Mr. Park, in his interesting Tour, first discovered this river, it appeared to him as broad as the Thames at Westminster, and flowing majestically, but slowly, from west to east, through the middle of a very extensive town, called Sego. This enterprising and ingenious traveller pursued the course of the Joliba from W. long $5^{\circ} 30'$ to Silla, long. $1^{\circ} 30'$, the utmost extent of his expedition. See GUIN and NIGER.

JOLITHUS, in *Botany*, from *jov*, a violet, and *λιδος*,

a stone, a cryptogamic plant, referred by Linnæus to the genus *Byssus*, by some others to that of *Lichen*. It is found in the form of broad crimson patches, when moist, smelling strongly of violets, or rather of Orris root, clothing the surface of stones in clear springs, as at Holywell in Flintshire, Tunbridge, and other places. Nothing is known concerning the fructification.

JOLLONE KEY, in *Geography*, a small island among the Bahamas. N. lat. $26^{\circ} 12'$. W. long. $77^{\circ} 2'$.

JOLO, or SOERE CARTA, a town of Java, and capital of the kingdom of Soefoehoenam.

JOLUCAR, a town of Spain, in the province of Granada; 7 miles N.E. of Motril.

JOLUT, an island near the west coast of East Greenland. N. lat. $60^{\circ} 56'$. W. long. $46^{\circ} 50'$.

JOLY, CLAUDE, in *Biography*, a French writer, was born at Paris in 1607. He was precursor of the cathedral of Paris, and died in that city in the year 1700. He was author of a book entitled "Maxims for the Education of a Prince," which was condemned by the judicature of Paris, and was burnt by the hands of the common hangman in 1665. He likewise wrote several other pieces, chiefly theological.

JOLY, GUY, a French writer of memoirs, was counselor to the king, and syndic of the renters of the hotel de ville, in Paris. He was attached to the cardinal de Retz, whom he followed, for a considerable time, in all his various fortunes. After the return of that minister from Rome, Joly quitted him on account of want of mutual confidence. He drew up "Memoirs from 1648 to 1665," in two volumes 12mo. which are chiefly an abridged account of what the cardinal himself has recorded in his own memoirs: but they are written in a more exact style than those of the cardinal, and contain many additional curious facts. Joly was engaged to defend the rights of the queen, and drew up "Remarks on Two Treatises written by Peter Stockmans in opposition to her Claims on Brabant and the Low Countries." He was author of another work, entitled "Intrigues of Peace, or Negotiations at Court by the Friends of M. le Prince, after his retreat in Guicenne." Moreri.

JOLY, in *Geography*, a port on the S. coast of Nova Scotia.

JOMELLI, NICOLÒ, in *Biography*, one of the most intelligent, learned, and affecting dramatic composers of modern times, was born at Avellino, a town about twenty-five miles from Naples, in which city he had his musical education under Leo and Durante. The first opera to which we find his name, is "Riccihero Rè de' Goti," composed for the Argentina theatre at Rome, 1740; and between that period and 1758, he composed for that city fourteen operas, besides others for Venice and different Italian theatres.

From 1758 to about 1768, he resided in Germany, being engaged in the service of the duke of Wurtemberg, at Stuttgardt, or rather at Ludwigsburg, his new capital, where Jomelli's works were performed. Here he produced a great number of operas and other compositions, by which he acquired great reputation, and totally changed the taste of vocal music in Germany. On his return to Italy, he left all these productions behind him, upon a supposition that he should again resume his station at Ludwigsburg, after visiting his native country. But as he never returned thither to claim these compositions, they fell into the hands of his patron, the duke of Wurtemberg, who preserved them as precious relics of this great master.

Proposals were published at Stuttgardt, in 1783, and in Cramer's *Mag. der Mus.* for September of the same year, for

for printing by subscription the entire dramatic works of Jomelli in score, which he composed during his residence at the court of the duke of Wurtemberg, consisting of fifteen serious operas, five pastoral dramas, and three burlettas; but whether this undertaking was ever accomplished, we have not been able to learn.

The serious operas which Jomelli composed for Stuttgart, are the following: "L'Olimpiade, La Clemenza di Tito, Nitteti, Pelope, Enea nel Lazio, Catone in Utica, Il Re Pastore, Alessandro nell' Indie, Ezio, Didone, Demofonte, Semiramide, Vologeso, Artaserse, and Fetonte." Pastoral dramas: "Imeneo in Atene, Il Pastore Illustre, and L'Isola Disabitata." Comic operas: "Il Matrimonio per Concorso, La Schiava Liberata, and Il Cacciatore Deluso."

Very few entire operas of Jomelli were ever performed in England: the first was "Attilio Regolo," in 1753, without any captivating finger. Serafini, first man, with little voice, though a good actor; and the Visconti, first woman, but now *passée*, were little able to render the music captivating, or even to do it justice. Yet an extraordinary circumstance happened during the whole run of this opera, which no other, perhaps, could ever boast. This drama was terminated by a piece of recitative without a subsequent air, in speaking which, Serafini was constantly encored. A circumstance the more extraordinary, as the English in general, who are ignorant of the Italian language, hate recitative, and would never go a second time to an opera, if not attracted by the airs and fine singing.

In 1755, Jomelli's opera of "Andromaca" was performed in London; in which the first air, "Si fosse un cor trianno," has considerable merit; but the close of the allegro is now old fashioned. A great part of this opera was composed by Jomelli in his first manner; but originality and the hand of a master always appear. The air, "Eccoti il figlio," as sung and acted by Mingotti, was truly dramatic and affecting. The whole is very superior to almost all contemporary productions.

In 1759, a duet by Jomelli, in the pasticcio opera of "Vologeso," was extremely pleasing, and the first which we remarked on the present dramatic model, chiefly in dialogue, with only bursts of passion, in two parts. And Elisi, while he was in England, sung several grand airs by Jomelli, composed on purpose to display that singer's dexterity in hitting wide intervals.

In 1768, Guarducci, instead of an opera for his benefit, had the oratorio of "Betulia Liberata," written by Metastasio, and set by Jomelli, in which, among many admirable compositions, an air of supplication by the high priest, through which were heard the murmurs of the people in a distant chorus, crying for peace and bread in tones so subdued as scarcely to be heard, was justly admired for its fine and new effect.

After he quitted Germany, Jomelli composed a great number of operas expressly for the king of Portugal, who tried every expedient to tempt him to go to Lisbon; which honour, though he declined, on account of the delicate state of his wife's health, yet he annually furnished that prince with new productions, as well as with whatever he composed for other purposes.

He composed, after his return to Naples, three operas for that city: "Armida," in 1769; "Demofonte," 1770; "Ifigenia in Aulide," 1771. And in 1772, "Achille in Sciro," for Rome, which was his last.

Some of the music which he composed for the dances of his operas has been much celebrated, particularly his "Chaconne," which is well known in England, and has served as

a model for that species of dance throughout Europe, ever since it was composed.

The operas of Jomelli will be always valuable to professors and curious collectors, for the excellence of the composition; though it has been thought necessary, in compliance with the general rage for novelty, to lay them aside and to have the same dramas new set for the stage, in order to display the talents, or hide the defects, of new fingers.

As Jomelli was a great harmonist, and naturally grave and majestic in his style, he seems to have manifested abilities in writing for the church, superior even to those for the stage.

Of the many oratorios he composed, we are only acquainted with three: "Isacco Figura del Redentore;" "Betulia Liberata;" and "La Passione;" all written by Metastasio, and all admirably set. In the first accompanied recitative and air of "Isacco," at the opening of the second part, beginning, "Chi per pietà mi dice, il mio figlio che fa?" in which are painted, with an uncommon degree of agitation and passion, the anxiety and terror of Sarah, during the absence of Abraham, whom she supposes is in the act of sacrificing her son Isaac, have been justly much admired.

We are in possession of a Te Deum and a Requiem of his composition, which manifest him to have been a great master of the church style; though he had acquired great fame as a dramatic composer before he began to exercise himself in this species of writing, concerning which he had never bestowed a thought since he left the music-school, or conservatorio, till about the year 1751, when it having been determined at Rome that the music for passion-week should be as excellent as possible, Durante, Jomelli, and Perez, were employed to set the lessons from the Lamentations of Jeremiah, for the three most solemn days of that holy time. Jomelli's composition was performed on Wednesday, Perez's on Thursdays, and Durante's on Good Friday. The first is entitled "Lettione Primo per li mercoledì santo, con Violini, Oboè, Viola, Flauti e Corni da Caccia." The second "Lettione Prima del Giovedì santo, a Soprano solo, con Violini, Viola, Oboè, e Corni da Caccia." And the third "Lettione Terza del Venerdì santo, a 4 Voci, con Violini, Viola, e Corni da Caccia." Having procured a score of these compositions at Rome, and lately examined them, we can venture to say that they all appear admirable: and as the composers were all men of great abilities, who exerted themselves on this honourable occasion, it is difficult to determine, in their several styles, which is the best. The productions of Jomelli and Perez are in an elevated, elegant, dignified, supplicating, and expressive oratorio style; and that of Durante more in the ancient style of church music: more learned in modulation, more abounding in fugue, and more elaborate in the texture of the parts, as might be expected from his maturer age, and the solemnity of the day on which his music was to be performed.

But though Jomelli acquired considerable fame by this composition for the church, yet he was so far from being intoxicated by it, that in a visit to Padre Martini, at Bologna, soon after, he told this learned contrapuntist that he had a scholar to introduce to him. Padre Martini assured him, that he should be glad to instruct any one so well recommended. And a few days after, the good father asking who and where was the disciple he had talked of? Jomelli answered, *Padre son io*; and pulling a *studio* of paper out of his pocket, on which he had been trying his strength.

strength in modulation and fugue upon *canto fermo*, begged of him to examine and point out his errors.

From this period he produced many admirable compositions for the church, in which he united elegance with learning, and grace with bold design. Among other productions of this kind, the two following merit commemoration. An "Offertorio," or motet, for five voices without instruments, followed by an Alleluja of four parts in chorus; and a "Missa pro defunctis," or burial service, which he composed at Stuttgart for the obsequies of a lady of high rank and favour at the court of his patron, the duke of Wurtemberg. These compositions, which are learned without pedantry, and grave without dulness, will be lasting monuments of his abilities as a contrapuntist.

But the most elaborate of all his compositions, is the "Miserere," or fifty-first psalm, translated into Italian verse, by his friend Saverio Mattei, which he set for two voices, accompanied with instruments, in 1773, the year before his decease. In this production, which breathes a pious gravity, and compunction of heart suited to the contrite sentiments of the psalmist, there is a manifest struggle at extraneous modulation and new effects, perhaps too much at the expence of facility and grace. Though all the movements of this composition are slow, yet the execution is so difficult, both to the voices and instruments, that when it was performed in London at Marchetti's benefit, it was the opinion of the late Mr. Bach, that Jomelli had purposely written what he could not execute himself, in order to perplex the performers. This, however, must have been said in pleasantry, for Jomelli had no malevolence in his disposition; perhaps in striving at excellence with too great solicitude, he sometimes had recourse to art and study, instead of giving way to his own feelings. There are, however, admirable strokes of passion as well as science in the music that he has set to this psalm, which, though above the comprehension of common hearers, will afford great pleasure to those that are able to read the score, or to follow the performers through the labyrinth of art.

This admirable composer had, in general, such a facility in writing, that he seldom courted the Muse at an instrument; and so tenacious a memory, that Sacchini assured us he frequently composed an air on opening a book of lyric poetry, while, like a peripatetic, he has been walking about a room, which he remembered a year after, and then committed it to paper, as fast as he could write a letter.

As Raphael had three manners of painting, Jomelli had three styles of composition. Before he went to Germany, the easy and graceful flow of Vinci and Pergolesi pervaded all his productions; but when he was in the service of the duke of Wurtemberg, finding the Germans were fond of learning and complication, he changed his style in compliance with the taste and expectations of his audience; and on his return to Italy, he tried to thin and simplify his dramatic Muse, which, however, was still so much too operose for Italian ears, that in 1770, upon a Neapolitan being asked how he liked Jomelli's new opera of "Demofonte," he cried out with vehemence, *è scelerata, Signore!*

Climate seems to operate so much on music, however its influence may be disputed in manners and government, that what is admired in one country is detested in another. In cold climates labour is necessary to circulation; in hot, ease is the grand desideratum. This principle is carried to such excess in Italy, that whatever gives the hearer of music the least trouble to disentangle, is Gothic, pedantic, and *scelerata*. As to difficulties of execution, in a single part, the composers and performers may spin their brains, and burst

their blood-vessels, and welcome, provided the texture of the parts is clear and simple.

The Gothic inventions, as they call them, of fugues, canons, and laboured counterpoint of the sixteenth century, they are willing to resign to the Flemings, who first brought them into Italy; but of which all the natives, except a few obstinate pedants, struggled to divest their music, particularly that for the stage, during the last two centuries.

It is the *excess* only of learning and facility that is truly reprehensible by good taste and sound judgment; and *difficult* and *easy* are relative terms, which they only can define. To lovers of music who have heard much in various styles, little is new; as to others who have heard but little, all is new. The former want research and new effects, which, to the latter, old music can furnish. Palates accustomed to plain food find *ragouts* and *morceaux friands* too highly seasoned; while to those who have long been pampered with dainties, simplicity is insipid. How then is a composer or performer to please a mixed audience, but by avoiding too much complacency to the exclusive taste of either the learned, or the ignorant, the supercilious, or the simple?

The health of Jomelli began to decline in 1770, soon after we had seen him in perfect health at Naples. He was then corpulent, and reminded us of the figure of Handel. In 1771, he had a stroke of the palsy, which, however, did not impair his intellects, as he composed "Achille in Sciro" for the Roman theatre, and a cantata for the safe delivery of the queen of Naples, in 1772; and in 1773, his Italian "Miserere," the most elaborate and studied of all his works.

His learned friend, Signor Saverio Mattei, the translator of the psalms into Italian verse, from whose admirable version Jomelli had taken the "Miserere," or fifty-first psalm, drew up a very interesting account of the works and public funeral of the great musician, and printed it in his "Saggio di Poesia Latine et Italiane," published at Naples immediately after his decease.

The reverence and regard with which we have been long impressed for the works and character of this gifted man, have already rendered the article too long to admit of further extension, or we should have wished to insert Signor Mattei's whole account; but having given it elsewhere, we shall here only cite the introduction, which does equal honour to the author and his friend.

Naples, September, 1774. "Yesterday all the musicians of this city united in celebrating the funeral of the great Jomelli. The church was very finely ornamented; and a great number of wax tapers were placed about the pompous bier. Two orchestras of three rows each could scarcely contain the vocal and instrumental performers who assisted in executing the music that was expressly composed on the occasion by the worthy Sabitini, who beat the time himself, as maestro di capella. It was the celebrated Genaro Manna, composer of the archiepiscopal church, who first suggested this plan of a public funeral, in which all these musicians had an opportunity of manifesting their regard for Jomelli, and of furnishing an example to posterity of the gratitude due to great talents, which may likewise stimulate young artists to merit equal honours. At the desire of Signor Manna, not only every musician attended the funeral and performed gratis, but contributed likewise towards the expences of this solemnity.

"Jomelli was my friend; he lived two years in my neighbourhood, and I had frequent opportunities of conversing with him, and of admiring his captivating manners, particularly his modesty in speaking of rival artists, whose compositions

positions he readily praised, though their authors were not equally candid in speaking of him.

"Jomelli had acquired considerable knowledge in other arts than music: his poetry was full of taste, and there is a fine ode of his writing, in the collection published at Rome, on the subject of the reconciliation between the pope and king of Portugal.

"He was ambitious of distinguishing himself from other composers in a way peculiar to himself. His invention was always fertile, his style lyrical and Pindaric; and just as Pindar darted from one subject to another, Jomelli changed his tones and themes in a way wholly new, and learnedly irregular."

This account is terminated with many excellent reflections on the style of Jomelli, and the cabals and frivolous taste of the Neapolitans at the time of his death. All we shall add is, that the latter works of Jomelli will be ever regarded with reverence by real judges of composition, as there is no mixture of trivial or fantastical movements or passages in his truly classical, and often sublime works.

JON, in *Natural History*, the name of a gem described by Pliny, and said to be brought from the East Indies; he describes it as being of a purple or violet colour, but rarely very deep in the tinge. It seems to have been a species of amethyst.

JON of Chios, in *Biography*, a tragic and lyric poet and philosopher, who first recited his poems in the 82d Olympiad, 452 years B.C., mentions in some verses quoted by Euclid, the ten-stringed lyre, *Δεκαχορδον λυρη*; a proof that the conjoint tetrachord was added to the scale in his time, which was about fifty years after Pythagoras is supposed to have constructed the octachord. Jon died, according to Fabricius, vol. i. p. 681, 419 B.C., and 78 years after Pythagoras. Besides tragedies and dithyrambics, Jon composed odes, pæans, hymns, and scolia, or convivial songs.

IONA, I, Hii, or *I-Colum-kill*, in *Geography*, one of the western islands of Scotland, in the Atlantic ocean, is separated from the western point of Mull by a narrow channel, called the sound of I. It measures about three miles in length, by three quarters of a mile in breadth. It is a place of much note in the early annals of the country, as the retreat of learning, during the age of barbarism and illiteracy which pervaded Europe after the overthrow of the Roman empire. Dr. Johnson calls this place "the luminary of the Caledonian regions, whence savage clans and roving barbarians derived the benefits of knowledge, and the blessings of religion." The monkish writers called this island Iona, which signifies the island of waves; Bede calls it Hii; but the proper name is I, (founded like the English *ee*), which in the Gaelic signifies island, this being called so by way of eminence. In more modern times, this insular district obtained the name of *I-Colum-kill*, that is, the island of Columba's-cell. The name Iona is now disused, and the island is generally called I, except when the speaker would wish to mark it with peculiar emphasis, and then it is expressed *I-Colum-kill*. The Druids were undoubtedly in possession of this island prior to the introduction of Christianity: a green eminence, close to the sound of I, is to this day called the Druid's burial place; and here are still extant the remains of a small Druidical temple, or circular row of upright stones, in a farm called Rossal, where, as the name imports, the courts of justice were held. The island seems to have been early the seat of a religious society of Christians, or order of monks, named Culdees, who settled here about the beginning of the sixth century. The foundation of a circular building or house, called the Culdees cell, still remains. The history of the Druids in this island is wholly

unknown; but that of the Culdees has been amply and learnedly narrated by Dr. Jamieson, in a quarto volume, published in 1811. It was reserved for Columba to raise the fame of the island to the great height it attained to in his own and after ages. This eminent man left his native country, Ireland, in the year 563, to preach the gospel to the Northern Picts; and having converted the Pictish monarch, obtained from him the grant of this sequestered isle, where he founded an abbey for canons regular. Having successfully presided here upwards of thirty years, he died June 9th, 597; leaving his abbey firmly settled, a people converted by his labours from Paganism to Christianity, and a name renowned for sanctity, piety, and "good works." The abbey acquired very extensive jurisdictions; held, for many ages, the chief sway among the Scottish and Pictish monasteries; and was liberally endowed by the piety and munificence of the kings and great men of Scotland. The Danes dislodged the monks in 807, and the abbey remained for several years depopulated; but on the retreat of the invaders, it received a new order of inhabitants, the Cluniaes, who continued to occupy it till the dissolution of monastic institutions, when the revenues were united to the see of Argyle; and, on the abolition of episcopacy, became the property of the duke of Argyle. The remains of the abbey, and its appendages, though much dilapidated, are, by the care and attention of the Argyle family, kept in better preservation than most ruins of the kind in Scotland. The late dukes built a wall round the whole abbey, to prevent further depredations; and prohibited their tenants from removing any fallen stones. Time has levelled some of the buildings with the ground; but the greater part is still standing. The cathedral, or St. Mary's church, is almost entire: it is built in the form of a cross, 115 feet in length, and 23 in width; the length of the transept 70 feet. In the churchyard is a cross of a single piece of red granite, 14 feet high, 22 broad, and 10 inches thick. St. Oran's chapel, said to be the first building begun by Columba, is still standing, but in a ruinous condition. The Virgin's chapel was entire till within a few years, when part of it fell. Most of the cloisters and the bishop's house are also standing. There is still remaining of the abbey, sufficient to give a tolerable idea of what it was. Of the nunnery, an establishment nearly coeval with the abbey, there are fewer remains: the church belonging to it is deprived of the roof. Here also stands what was called the parish church, yet entire, but verging to decay. Near the chapel of St. Oran is a large enclosure, called the "burying-place of Oran," in which are deposited the remains of forty-eight Scottish kings, four kings of Ireland, eight Norwegian monarchs, and one king of France, who were ambitious of reposing in this hallowed ground. In the same sanctuary, at a respectful distance, lie most of the lords of the isles.

The island of I is included in the united parishes of Kilfinchen and Kilviceuen. It abounds with many valuable minerals. Here is but one small village, containing about 60 houses and 350 inhabitants. The parish minister of Kilviceuen visits this island every quarter of a year, which is the only opportunity of public worship and religious instruction which the people now enjoy. Strange reverie! that divine service should be performed but four times in the year, in a place where it was formerly celebrated as many times in a day. Sinclair's Statistical Account of Scotland, vol. xiv. Pennant's Tour in Scotland. Johnson's Journey to the Western Islands. Chalmers's Caledonia. Jamieson's Historical Account of the ancient Culdees, &c. 4to. 1811.

IONA, a town of Hindoostan, in the country of Delhi; 25 miles S. of Delhi.

JONÆ PISCIS, the *Jonas-fish*, a name given by many authors to the common shark, the *canis carcharias* of authors.

It has this name from an opinion that it was the fish which swallowed up the prophet of that name. But there are many objections to such an opinion.

JONAH, or the *Prophecy of Jonah*, who was the son of Amittai, and a native of Gathhepher, a town belonging to the tribe of Zebulon, in Lower Galilee, a canonical book of the Old Testament, in which it is related, that Jonah was ordered to go and prophesy the destruction of the Ninevites; but that disobediently attempting a voyage another way, he was discovered by the rising of a sudden tempest, and cast into the sea, where he was swallowed up by a large fish. Having lodged three days and three nights in the belly of the fish, he was disgorged upon the shore: whereupon, being sensible of his past danger, and surprising deliverance, he betook himself to the journey and embassy to which he was appointed. Arriving at Nineveh, the metropolis of Assyria, he, according to his commission, boldly laid open to the inhabitants their sins and miscarriages, and proclaimed their sudden overthrow; upon which the whole city, by prayer and fasting, and a speedy repentance, happily averted the divine vengeance, and escaped the threatened ruin. Jonah, instead of admiring the divine clemency, was indignant under the apprehension that his veracity would be suspected, and that he would be deemed by the people to be a false prophet. Having retired from the city, he prepared for himself a booth, over which a plant sprang up miraculously in one night, which, by its spreading foliage, sheltered him from the burning heat of the sun. But the plant suddenly withering away, so that he was exposed to a suffocating wind and the sun's scorching beams, he again expressed his impatience, and his wish to die rather than to live in such circumstances of distress. At length, having been reproved for his impatient, querulous temper, and the conduct of Providence in sparing the Ninevites having been justified to his full conviction, his complaints were silenced. Of his further history we have no authentic account. Jonah was the most ancient of all the prophets whose writings are preserved in the Scripture canon. Some have supposed that he prophesied in the latter end of Jehu's, or the beginning of Jehoahaz's reign, at which time the kingdom of Israel was brought very low by the oppressions of Haz-el king of Syria. (2 Kings, xiii. 22.) Others refer his predictions to the reign of Jeroboam II. king of Israel, or between the years 823 and 783 B.C. 2 Kings, xiv. 25. Newcome's Version and Notes.

JONDAL, in *Geography*, a town of Norway, in the the diocese of Bergen; 30 miles E. of Bergen.

JONDISABUR, a town of Persia, in the province of Chumdan; 185 miles E.S.E. of Bagdad.

JONEIKISCHKEN, a town of Prussian Lithuania; 36 miles W. of Tilsit.

JONES, in *Biography*, a Welshman who was blind, and the best performer on the harp of his time. The old duchess of Marlborough would have retained him in her service, with a pension, as an inmate; but he could not endure confinement, and was engaged by Evans, the landlord of a well-accustomed home-brewed ale-house, at the Hercules' Pillars, opposite Clifford's Inn passage in Fleet-street, where he performed in a great room up stairs during the winter season. He played extempore voluntaries, the fugues in the sonatas and concertos of Corelli, and most of his solos, with many of Handel's opera songs, with uncommon neatness, which were thought great feats, at a time when scarcely any thing but Welsh tunes with variations was ever at-

tempted on that instrument in the hands of other harpers. He also played on the violin, and accurately imitated on that instrument, to the great delight of the home-brewed ale-drinkers, the sobs, sighs, and groans of a Quaker's sermon.

Evans dying, his widow took Cuper's Gardens in Surrey, opposite to Somerset-house; erected an orchestra there, which was reckoned the best for music in the kingdom; furnished it with an organ, which was played by little Harry Burgcs, the harpichord-player at Drury-lane, with his usual unmeaning neatness; and established the Gardens as an evening place of entertainment for the summer season, like Vauxhall, with the addition of fire-works. But it was too much in the vicinity of Drury-lane and Covent-garden for order and decorum to be long preserved inviolate; so that after four or five summers, it was suppressed by the magistrates; and poor Jones, who had been admitted as a performer in the orchestra by mother Evans, (as she was usually called,) losing both his salary and importance, died about the year 1748. He was buried in Lambeth churchyard, and his funeral procession, attended by a great number of musical people, was solemnized by the performance of a dead march by a voluntary band of innumerable instruments.

JONES, JOHN, late organist of St. Paul's, the Charter-house, and joint organist of the Temple with Stanley. The father of this musician, a worthy man of professional merit and good conduct, having lived many years at lady Vanbrugh's, Whitehall, as a domestic musician, prevailed on her ladyship to patronize his son; which she did so effectually, that though his abilities as a performer or composer were not above mediocrity, nor were his person or manners very captivating, yet, by the zeal and influence of his father's patroness, he obtained three places, which are regarded by musicians as the posts of honour in London, and more desirable, if the king's chapel be excepted, than any at which an organist can aspire.

JONES, JOHN, a physician of the 16th century, and author of several works, but of whose history little more is known than that he was born in Wales, or was of Welsh extraction; that he studied at both our universities, and took a medical degree at Cambridge; and that he became eminent in the practice of his profession at Bath, and in Nottinghamshire and Derbyshire. He mentions curing a person at Louth in 1562; and the date of his last publication is 1579. He wrote only in the English language, and left the following works: 1. "The Dial of Agues," Lond. 1556; 2. "The Benefit of the ancient Bathes of Buckstone, which cureth most grievous Sickneses," *ibid.* 1572. This work contains very little concerning either the nature or history of these baths; but chiefly general directions, compiled from ancient authors, relative to the diet and regimen proper to be used with a course of bathing; 3. "The Bathes of Bath's ayde, wonderful and most excellent against very many Sickneses," *ibid.* 1572.; 4. "A brief, excellent, and profitable Discourse of the natural Beginning of all growing and living Things, Heat, Generation, &c." Lond. 1574; 5. "A Translation, from Latin into English, of Galen's four Books of Elements," *ib.* 1574. Dr. Aikin puts the following *quere*, after mentioning this work: "Is not this the same with the preceding piece?" 6. "The Art and Science of preserving Body and Soul in Health, Wisdom, and Catholic Religion," 1579, 4to. See Aikin, *Biog. Mem. of Med.*

Another physician, of the name of JOHN JONES, is mentioned by bibliographers, who was born at Landaff, and was admitted a member of the Royal College of Physicians, in

in London, near the end of the 17th century, and was author of the following publications: 1. "Novarum Dissertationum de morbis abstrusioribus Tractatus primus, de Febribus intermittentibus. In quo obiter de Febri continuæ natura explicatur," Lond. 1683; 2. "De morbis Hibernorum et de Dysenteria Hibernicâ," ib. 1698.; "The Mysteries of Opium revealed," ib. 1701. Eloy. Dict. Hist.

JONES, INISO, an eminent architect, was born in London about the year 1572. He was probably intended for a mechanical employment, but his talent for the fine arts attracted the notice of some considerable persons about the court, among whom were the earls of Arundel and Pembroke. To the latter of these noblemen he was indebted for that degree of patronage which enabled him to visit Italy for the purpose of perfecting himself in landscape-painting; to which his genius seemed first to point. He took up his residence chiefly at Venice, where it is said the works of Palladio gave him a turn to the study of architecture, which branch of art he made his profession. He was invited by Christian IV. king of Denmark, to undertake the office of his first architect. Having been some years in the service of that sovereign, he accompanied him, in 1606, on a visit to his brother-in-law, king James; and, expressing a desire of remaining in his native country, he was appointed architect to the queen. He served prince Henry in the same capacity, and obtained a grant, in reversion, of the place of surveyor-general of the works. After the death of the prince, Mr. Jones visited Italy again, and spent some years there in improving himself in his art. On his return he undertook the duties of the office of surveyor-general, and finding the Board of Works much in debt, he relinquished his own dues, and prevailed upon the other principal officers to do the same, till all arrears were cleared. In 1620 the king sent him to investigate the nature and purpose of that remarkable antiquity, Stonehenge; and he wrote a treatise to prove that it was the work of the Romans, but he made no converts to this opinion. He was now employed in building the banquetting-house at Whitehall, which remains a model of the pure and elegant taste of the architect. He was likewise appointed a commissioner for repairing the cathedral of St. Paul's, which office, as well as his other posts, was continued to him under the reign of Charles I. The repairs of St. Paul's did not commence till 1633; and he is accused of having committed, in that undertaking, some capital faults by mixing the Roman and Grecian style with the Gothic. He had much employment both from the court and nobility, and realized a handsome fortune, which was diminished by his sufferings during the troubles which succeeded. He was obnoxious as a favourite of his royal master, and as a Roman Catholic. He was first attacked in 1640, when he was called before the house of lords, on a complaint of the parishioners of St. Gregory's, for demolishing part of their church, in order to make room for his additions to St. Paul's. He was fined, in 1646, 545*l.* as a malignant. He was much afflicted by the king's death, and died, worn down by grief and misfortune, in July 1651. He was the greatest English architect previously to sir Christopher Wren. A collection of his designs was engraved and published by Mr. Kent, in two volumes folio, 1727. Others were published in 1743 and 1744. A copy of Palladio's architecture, with manuscript notes by Mr. Jones, is in the library of Worcester college, Oxford. Biog. Brit.

JONES, WILLIAM, father of sir William, the subject of the next article, was born in the year 1680, in the island of Anglesey, North Wales. His parents were yeomen, or

little farmers, in that island, and gave to their son the best education which their circumstances would allow; but he owed his future fame and fortune to the diligent cultivation of the intellectual powers by which he was eminently distinguished. Addicted from early life to the study of mathematics, he commenced his career of advancement in the humble office of a teacher of these sciences on board a man of war. In this situation he attracted the notice, and obtained the friendship of lord Anson. He appeared as an author in his 22d year; when his treatise on the art of navigation was much approved. We may judge of his predominant taste for literature and science by a trivial circumstance which occurred at the capture of Vigo, in 1702. Having joined his comrades in pillaging the town, he selected a bookseller's shop, in hope of obtaining some valuable plunder; but, disappointed in his expectations, he took up a pair of scissors, which was his only booty, and which he afterwards exhibited to his friends as a trophy of his military success. On his return to England, he established himself as a teacher of mathematics in London; and here, at the age of 26 years, he published his "Synopsis Palmariorum Matheseos;" a work which has ever since been held in the highest estimation as a compendious but comprehensive summary of mathematical science. Mr. Jones was no less esteemed and respected on account of his private character and pleasing manners, than for his natural talents and scientific attainments; so that he reckoned among his friends the most eminent persons of the period in which he lived. Lord Hardwicke selected him as a companion on the circuit, when he was chief justice; and when he afterwards held the great seal, conferred upon him the office of secretary for the peace, as a testimony of his friendship and regard. He was also in habits of intimate acquaintance with lord Parker, president of the Royal Society, sir Isaac Newton, Halley, Mead, and Samuel Johnson. So highly was his merit appreciated by sir Isaac Newton, that he prepared, with his permission, and very much to his satisfaction, a very elegant edition of small tracts in the higher mathematics. Upon the retirement of lord Macclesfield to Sherborne castle, Mr. Jones resided in his family, and instructed his lordship in the sciences. Whilst he occupied this situation he had the misfortune, by the failure of a banker, to lose the greatest part of that property which he had accumulated by the most laudable industry and economy; but the loss was in a great measure repaired to him by the kind attention of his lordship, who procured for him a secure place of considerable emolument. He was afterwards offered, by the same nobleman, a more lucrative situation; which, however, he declined, that he might be more at leisure to devote himself to his favourite scientific pursuits. In this retreat he formed an acquaintance with Miss Mary Nix, the daughter of a cabinet-maker, who had become eminent in his profession, and whose talents and manners had recommended him to an intimacy with lord Macclesfield. This acquaintance terminated in marriage; and the connection proved a source of personal satisfaction to Mr. Jones himself, and of permanent honour to his name and family. By this lady Mr. Jones had three children; two sons and a daughter. One son died in infancy; the other will be the subject of the next article; and the daughter, who was married to Mr. Rainsford, an opulent merchant retired from business, perished miserably, in the year 1802, in consequence of her clothes accidentally taking fire. The death of Mr. Jones was occasioned by a polypus in the heart, which, notwithstanding the medical attention and assistance of Dr. Mead, proved incurable. Of the singular self-possession and promptitude of Mrs. Jones, the following anecdote is related. A friend,

who knew her husband's dangerous situation, addressed him with a letter of condolence, recommending acquiescence and resignation from a due consideration of the brevity of life. Mrs. Jones, perceiving its purport, and probably dreading its effects on the spirits of her husband, when she was desired by him to read it, composed in the moment another letter so clearly and so rapidly, that he had no suspicion of the deception; and this she executed in a style so cheerful and entertaining, that, instead of being depressed, he was greatly exhilarated by it. His disorder at length terminated in his death, which happened soon after the incident we have related, in July 1749. The property of which he died possessed was moderate; but his reputation was universally acknowledged. After his death, the widow was favoured with many offers of service by those who respected her deceased husband; and she was under peculiar obligations to Mr. Baker, author of a treatise on the microscope, &c. for assistance in arranging the collection of shells, fossils, and other curiosities left by Mr. Jones, and disposing of them to the greatest advantage. His library was bequeathed to lord Macclesfield. It has been said by the compilers of the Biographical Dictionary, that Mr. Jones had completed a very important mathematical work, and had actually sent the first sheet to the press, but that the progress of his disorder obliged him to discontinue the impression. It is moreover said, that the MS. fairly transcribed, was entrusted, a few days before his demise, to the care of lord Macclesfield, who promised to publish it for the honour of the author, and the benefit of his family. If this account be true, and a work, which was to have been entitled, "The Introduction to the Mathematics," had been actually prepared, the MS. must have been lost, as it could not be found among the books and papers of lord Macclesfield, who survived his friend many years. Among the memoranda of sir William Jones there is no document that serves to confirm or disprove this account. The mathematical works of Mr. Jones, that have been published, are much admired for neatness, brevity, and accuracy; and they afford ample evidence, testified also by his correspondence with Mr. Cotes of Cambridge, that he was a very eminent mathematician. We have already mentioned his "New Compendium of the whole Art of Navigation," 8vo. 1702; and his "Synopsis Palmariorum Matheos; or, a new Introduction to the Mathematics, containing the Principles of Arithmetic and Geometry, demonstrated in a short and easy Method," 8vo. 1706. In the Philosophical Transactions, we have several papers on logarithms, on the properties of conic sections, on the disposition of equations for exhibiting the relations of geometrical lines, &c. communicated to the Royal Society, of which he was a member. He was also the editor of some mathematical works of sir Isaac Newton, under the title of "Analysis per quantitatum series, fluxiones, ac differentias; cum enumeratione linearum tertii ordinis." *Memoirs of the Life, Writings, and Correspondence of sir William Jones*, by lord Teignmouth.

JONES, *Sir WILLIAM*, the son of the subject of the preceding article, was descended, by the maternal side, from some of the ancient princes and chieftains of North Wales; but he is entitled to notice in this place on account of much more important and valuable distinctions; those of talents, acquirements, and character, which raised him to a rank of pre-eminence, that has been attained by few either in ancient or modern times. From the materials supplied by lord Teignmouth, in his ample and excellent "Memoirs of the Life, Writings, and Correspondence of sir William Jones," in addition to those which our own recollection will furnish, we shall be able to give an account of this dis-

tinguished person, which, however imperfect it may be, and however inadequate to our sentiments of personal respect, and feelings of lively gratitude, cannot fail of being interesting to our readers; nor will they need any apology if we exceed our usual limits on this occasion.

Sir William Jones was born in London on the eve of the festival of St. Michael, in the year 1746; but having lost his father when he was three years old, the care of his education devolved upon his mother, who appears to have been eminently qualified to direct and superintend it, more particularly in his infant years. Her character has been delineated by her husband in the following terms: "She was virtuous without blemish, generous without extravagance, frugal but not niggard, cheerful but not giddy, close but not fullen, ingenious but not conceited, of spirit but not passionate, of her company cautious, in her friendship trusty, to her parents dutiful, and to her husband ever faithful, loving and obedient." Mrs. Jones took great pains, by the study of algebra, trigonometry, and navigation, to qualify herself for being the preceptress of her sister's son; and to these sciences, rather remote from a lady's province, she paid particular attention, because he was destined to a maritime profession. Her solicitude for the improvement of her own son induced her to decline accepting the kind invitation of the countess of Macclesfield to remain at Sherborne castle, after her husband's death; and her discriminating judgment led her, in her plan for his instruction, to reject the severity of discipline, and to conduct his mind insensibly to knowledge and exertion, by exciting his curiosity and directing it to useful objects. In consequence of her attention, he was, in his fourth year, able to read distinctly and rapidly any English book; and with a view to the cultivation of his memory, she caused him to learn and repeat some of the most popular speeches in Shakspeare; and the best of Gay's fables. His propensity to reading was signally manifested in his fifth year; and in his sixth he was initiated by the assistance of a friend in the rudiments of the Latin grammar. At Michaelmas 1753, in the close of his seventh year, he was placed at Harrow school, of which Dr. Thackeray was the head master. During the two first years of his residence in this seminary, he was distinguished more by diligence than by superiority of talents; but his faculties gained strength by exercise, and the prospect of the eminence to which he afterwards attained gradually brightened. His mother, who anxiously watched over his progress, improved the opportunities which his vacations, and the absence of 12 months from school, in consequence of the fracture of his thigh-bone, afforded, of increasing his acquaintance with his native tongue, and with English authors, and of teaching him also the rudiments of drawing, in which she herself excelled. During this interval, the progress of his classical studies was interrupted. However, on his return to school, he was placed in the class to which he would have attained, if no interruption had occurred. This error of judgment, on the part of his master, though it subjected him to corporal punishment and degradation for non-performance of exercises which should not have been required, and though it produced in his mind an invincible abhorrence of his master's conduct, served to rouse his emulation, and to call forth the exertion of his native powers; so that in a little while he was advanced to the head of his class, and might, if he had been so disposed, have retorted on his class-fellows their former reproaches of his indolence or dulness. In his 12th year, he was removed to the upper school. At this time a circumstance occurred, which afforded signal evidence of the strength and tenaciousness of his memory. His school-fellows proposed

to amuse themselves with the representation of a play; and at his recommendation the *Tempest* was selected; but not being able to procure a copy, he furnished them with it from his memory; and in the exhibition he performed the part of Prospero. As he advanced in the school, his diligence increased; and he commenced the study of the Greek language. At this time he translated into English verse several of the epistles of Ovid, and all the pastorals of Virgil; and he composed a dramatic piece on the story of Meleager, which he denominated a tragedy, and which, during the vacation, was acted by some of his most intimate school-fellows; the part of the hero being performed by himself. His acquaintance with prosody was very distinguished; so that he was able to scan the trochaic and iambic verses of Terence, before his companions suspected that they were any thing but mere prose. At school he wrote the exercises of many boys in the two superior classes, and those in his own class were happy to become his pupils. During the holidays he learned the rudiments of French and arithmetic; and in this early age he was highly gratified by being honoured with an admission to the society of learned and ingenious men at the house of Mr. Baker and his friend Mr. Pond. At the request of his mother he read the "*Speſtacle de la Nature*;" but derived greater amusement, as he acknowledged, from the Arabian tales, and from Shakspeare, whose poems and plays he repeatedly perused with increased delight. At Harrow he invented a political play, in which Dr. Bennet, bishop of Cloyne, and the celebrated Dr. Parr, were his principal associates. "They divided the fields in the neighbourhood of Harrow, according to a map of Greece, into states and kingdoms; each fixed upon one as his dominion, and assumed an ancient name. Some of their school-fellows consented to be styled barbarians, who were to invade their territories and attack their hillocks, which were denominated fortresses. The chiefs vigorously defended their respective domains against the incursions of the enemy; and in these imitative wars the young statesmen held councils, made vehement harangues, and composed memorials, all doubtless very boyish, but calculated to fill their minds with ideas of legislation and civil government. In these unusual amusements Jones was ever the leader." In his 15th year Dr. Thackeray was succeeded by Dr. Sumner, who soon discovered the talents and acquirements of his pupil; and who afforded him every advantage in the prosecution of his studies which he had it in his power to grant him. Indeed this excellent instructor of youth, with an excusable partiality and an amiable modesty, was heard to declare, "that Jones knew more Greek than himself, and was a greater proficient in the idiom of that language." During the two years which he spent with Dr. Sumner, he employed his time in reading and imitating the best ancient authors of Greece and Rome; and, devoting the night as well as the day to study, he acquired the knowledge of the Arabic characters, and a sufficient acquaintance with the Hebrew language to enable him to read some of the Psalms in the original. His reputation was at this early period of his life so extensive, "that he was often flattered by the inquiries of strangers, under the title of the great scholar." Some of his juvenile compositions, both in prose and verse, may be found in the fragment of a work which he began at school, and entitled "*Limon*," in imitation of Cicero, and may be found in the complete edition of his works. His incessant application occasioned a weakness in his sight, which rendered it necessary for Dr. Sumner to interdict it during the last months of his residence at Harrow. The intervals of interrupted study, which he reluctantly allowed himself, were employed in learning chess, by practising

the games of Philidor. As he was intended for the profession of the law, for which, however, he does not seem to have had any great predilection, some of his friends recommended his being placed, at the age of 16, in the office of a special pleader; others, however, wished him to be removed from Harrow to one of the universities. The choice of an university was for some time the subject of deliberation; but at length Oxford was preferred in consequence of the recommendation of Dr. Glasſe, and the inclination of his mother, who determined to reside with him at the university. In the spring of 1764 he was matriculated and admitted into University college; and in the following term, after having spent a few months at Harrow, in order to finish a course of lectures in which he was much interested, he fixed himself at Oxford. Upon his first settlement in the university he was rather disgusted than pleased with the plan of education. "Instead of pure principles on the subjects of taste, on rhetoric, poetry, and practical morals, he *complained* that he was required to attend dull comments on artificial ethics, and logic detailed in such barbarous Latin, that he professed to know as little of it as he then knew of Arabic." The only logic then in fashion was that of the schools: and in a memorandum written by himself, which," says his biographer, lord Teignmouth, "is my authority for these remarks, I find an anecdote related of one of the fellows, who was reading Loeke with his own pupils, that he carefully passed over every passage in which that great metaphysician derides the old system." After a residence of a few months at the university, on the 31st of October, 1764, Mr. Jones was unanimously elected one of the four scholars on the foundation of sir Simon Bennett, for which assistance he was grateful; more especially as the prospect of a fellowship was remote. Added to oriental literature for several years, he now indulged his inclination by the study of Arabic under the example and encouragement of a fellow student, and with the assistance of a native of Aleppo. His situation at the university became gradually more pleasant to him than it was at first; for his college tutors, perceiving that his whole time was devoted to improvement, dispensed with his attendance on their lectures, and even allowed him to pursue his studies in a manner agreeable to his taste and inclination. To the perusal of the principal Greek poets and historians, and of the entire works of Plato and Lucian, he added the study of the Arabic and also of the modern Persian languages. During his vacations, which he spent in London, he attended the schools of Angelo, in order to acquire the elegant accomplishments of riding and fencing; and at home he directed his attention to the modern languages; reading the best authors in Italian, Spanish, and Portuguese. The possession of a fellowship, which he was anxious of obtaining, partly for relieving his mother from the burden of his education, and partly for securing some kind of independence, however inconsiderable, to himself, was still at a distance; and he almost despaired of obtaining it. Having been recommended to the family of earl Spencer by Dr. Shipley, to whom he was not personally known, but who was not unacquainted with his compositions at Harrow, an offer was made to him by Mr. Arden, related, by marriage, to his friend Sumner, of being private tutor to lord Althorp, now earl Spencer. The proposal was cheerfully accepted, and upon an interview with his pupil, then seven years old, he was so pleased, that he determined to give up all thoughts of a profession, and to devote himself to the faithful discharge of the duties of education now devolved upon him. In the summer of 1765, he wholly left the university, and entered on his new office. At Wimbledon,

where he resided till the approach of winter, he found leisure to compose many of his English poems, and to read the greatest part of the Old Testament in Hebrew, particularly the book of Job, and the Prophets, which he studied with great attention. In the following summer a fellowship became vacant, and he was elected to it Aug. 7, 1766. At this time he was offered by the duke of Grafton, then at the head of the treasury, the place of interpreter for Eastern languages, which he politely declined, apprehending that it would be inconsistent with his other engagements and pursuits. In the course of this summer he formed an acquaintance with a young lady, Anna Maria, the eldest daughter of Dr. Shipley, then dean of Winchester, who was visiting at Wimbledon, to which he owed the happiness of his future life. But such were his views of an honourable independence, and his resolution never to owe his fortune to a wife, or her kindred, that, notwithstanding the impressions made upon his heart by the person and conversation of this lady, he could not then admit any idea of a matrimonial connection. In the following winter he attended the two schools of Angelo, and by a secret arrangement with Gallini, acquired the accomplishment of dancing. Having occasion to accompany Lord Spencer's family to Spa in the summer of 1767, he improved himself, during the short period of three weeks' residence in this place, in the art of dancing, by the lessons of Janfon of Aix-la-Chapelle, and acquired a very considerable knowledge of the German language. In the year 1768 application was made to Mr. Jones by the secretary of state, on behalf of the king of Denmark, then in England, requesting him to give a literal translation of the life of Nadir Shah in the French language. Having for some time declined the proposal, he at length accepted it; and the translation was published, after some delay, in the year 1770. To the history of Nadir Shah, he added a treatise on Oriental Poetry, which treatise, executed by a young man in his 23d year, has been justly considered as an extraordinary performance; "instructive and elegant, interesting from its novelty, entertaining from its subject and variety, and exhibiting the combined powers of taste and erudition." Being at Tunbridge in 1768, he then began to learn music, and afterwards received lessons from Evans on the Welsh harp. We may here mention his attendance on a course of anatomical lectures by the celebrated Hunter, and his study of the mathematics, which he so well understood, as to be able to read and understand Newton's Principia.

In the beginning of this year he had commenced an acquaintance with Reviczki, afterwards the imperial minister at Warsaw, and ambassador at the court of England, with the title of count. This accomplished nobleman being captivated by the charms of oriental literature, cultivated an intimacy with Mr. Jones, which was continued by a correspondence, that was carried on for many years. Many of the letters that passed between them on their favourite subject are published in the life by Lord Teignmouth. In the summer of 1769, Mr. Jones attended his pupil to Harrow; and it was with peculiar satisfaction that he renewed that intercourse with Dr. Sumner, which had been for some time interrupted, though not altogether discontinued. Here he transcribed a Persian grammar, which three years before he had composed for a school-fellow, who was destined for India; he also began a dictionary of the Persian language.

Of the religious principles of Mr. Jones some account may be reasonably expected. Whilst he was at Harrow, in his 24th year, we have reason to believe that his faith in Christianity was not unblended with doubts. Indeed no particular attention seems to have been paid to this part of his education; a circumstance which, we confess, appears to us

surprising, and for which we are unable to account. His mind, however, was so upright and so well disposed, that he expressed his doubts, not in the too fashionable mode of conceited cavilling, but with a sincere desire of obtaining a solution of them. Finding himself disappointed, he determined to examine the subject for himself, and to peruse the whole scripture in the original, that he might be enabled to form a correct judgment of the connection between the two parts, and of their evidence both internal and external. The result was a firm belief in the authenticity and inspiration of the sacred writings. About this time he drew up a series of propositions, which have been found in his own hand-writing in a Hebrew copy of the book of Hosea, and which contain the sketch of a demonstration of the divine authority of the Christian religion. To these propositions, transcribed by his biographer, the following note is subjoined: "what must be the importance of a book," of which it may be truly said, "if this book be not true, the religion which we profess is false?"

Towards the end of the year 1769, Mr. Jones accompanied Lord Spencer's family to the continent. Soon after his return he adopted the resolution of altering his plan of life. The course which he was pursuing, however agreeable it was rendered to him by the family with which he was connected, did not exactly correspond to that idea and spirit of independence which marked his character. "He united the laudable desire of acquiring public distinction and of making his fortune by his own efforts: above all, he was animated with the noble ambition of being useful to his country;" accordingly he determined to devote himself to the study and practice of the law; and with this view he was admitted into the Temple on the 19th of September 1770. His attachment to Oriental literature and to general science, however, continued unabated, notwithstanding the time and attention which he devoted to his new profession. In 1772 he published a small volume of poems, consisting chiefly of translations from the Asiatic languages, with two prose dissertations annexed: and though he does not appear to have communicated any paper for the Philosophical Transactions, he was, on the 30th of April 1772, elected a fellow of the Royal Society. On occasion of taking his Master's degree in the university in 1773, he composed an oration, intending to have spoken it in the theatre. The speech was published 10 years after, and the topics that characterize it are, "an ardent love of liberty, an enthusiastic veneration for the university, a warm and discriminate eulogium on learned men, who devoted their talents and labours to the cause of religion, science, and freedom." In the commencement of 1774, he published his commentaries on Asiatic poetry, a work begun in 1766, and finished in 1769, when he was in his 23d year, which "was received with admiration and applause by the oriental scholars of Europe in general, as well as by the learned of his own country." To these commentaries is annexed an elegant address to the Muse, in which Mr. Jones declares his purpose of renouncing polite literature, and devoting himself altogether to the study of the law. In January 1774 he was called to the bar; and for some years he seems to have inflexibly adhered to the above-mentioned resolutions. For some time he declined practice, and sedulously applied himself to his legal studies. In 1775, for the first time, he attended the spring circuit and sessions at Oxford; perhaps more as a spectator than an actor; and in the following year he was regular in his attendance at Westminster-hall. In 1778 he published a translation of the speeches of Iæus, in causes concerning the law of succession to property at Athens, with a prefatory discourse, notes critical and historical, and a commentary. The year

1784 forms an interesting era in the memoirs of Mr. Jones. His professional practice had increased, and afforded a prospect of farther enlargement with augmented profit; but as his views were particularly directed to the vacant seat on the bench of Fort William in Bengal, and as lord North had encouraged his expectation of occupying it, he was less anxious about the augmentation of business in his legal profession. In this state of suspense, the political events of the times engaged his attention. To the American war; in its commencement and further progress, he was decidedly adverse. At this time the reflections which he indulged dictated a very animated and classical ode to liberty, which he composed in Latin, and published under the title of "*Julii Mæligoni ad Libertatem*," the assumed name being formed by a transposition of the letters of *Gulielmus Jonesius*. This ode strongly displays his genius, erudition, feelings, and political principles. The vacancy of a seat in parliament for the university of Oxford being likely to occur, Mr. Jones was encouraged by his friends to offer himself as a candidate; but though he was ambitious of this honour, the disappointment gave him no great concern. Although this contested election occupied a considerable portion of his thoughts and time, he found leisure to publish a small pamphlet, entitled "*An Inquiry into the legal Mode of suppressing Riots, with a constitutional Plan of future Defence*." In a speech, eminently characteristic of his principles and feelings, which he intended to have delivered at a meeting of the freeholders of Middlesex, assembled Sept. 9th of this year; for nominating two representatives in the new parliament, he reprobated the American war and the conduct of the late parliament in supporting it: he expressed his sentiments without reserve on the African slave trade, and avowed the conduct which he would have pursued, if he had been placed in the house of commons. In the course of this year, the death of his mother, to whom he was attached by every possible tie of nature, affection, and gratitude, involved him in the deepest affliction. In this and the following year he was diligently employed in his professional studies and practice, whilst literature and politics also engaged a degree of his attention; but the principal object of his ambition and hopes was the vacant seat on the bench in India. Whatever was connected with this object interested his thoughts; and hence he was led to undertake the translation of an Arabian poem on the Mohammedan law of succession to the property of intestates. In the year 1782 the public attention was much occupied with attempts to procure, by constitutional means, a reformation of parliament. This was a business congenial to Mr. Jones's sentiments and feelings; and he concurred in the public efforts for this purpose, both by speaking and writing. About this time he published his "*Essay on the Law of Bailments*;" and in the same year, 1782, he became a member of the Society for Constitutional Information. In his letter of acknowledgment for being elected into this society, he professes his attachment to the excellent constitution of his country; and then adds, "on the people depend the welfare, the security, and the permanence of every legal government; in the people must reside all substantial power; and to the people must all those, in whose ability and knowledge we sometimes wisely, often imprudently, confide, be always accountable for the due exercise of that power with which they are for a time entrusted." Whilst he was at Paris, in the year 1782, he wrote a little "*jeu d'esprit*," as he calls it; and of which he says, in a letter to lord Althorp, "it was printed here by a society, who, if they will steer clear of party, will do more good to Britain, than all the philosophers and antiquaries of Somerset house. But to speak the truth, I greatly doubt, whether they, or any other man in this country, can do it

substantial good. The nation, as Demosthenes says, will be fed like a consumptive patient, with chicken broth and parada, which will neither suffer him to expire, nor keep him wholly alive." This "*jeu d'esprit*" was a "Dialogue between a Farmer and Country Gentleman on the Principles of Government." After a bill of indictment had been found against the dean of St. Asaph, for the publication of the edition, which was printed in Wales, sir William Jones sent a letter to lord Kenyon, then chief-justice of Chester, in which he avowed himself to be the author of the dialogue, and maintained that every position in it was strictly conformable to the laws and constitution of England. In the beginning of 1783, Mr. Jones published his translation of the seven Arabian poems, which he had finished in 1781. The most interesting period of Mr. Jones's life was now approaching; for in March 1783, by the active friendship of lord Ashburton, and under the administration of lord Shelburne, he was appointed a judge of the supreme court of judicature at Fort William in Bengal, on which occasion he received the honour of knighthood; and in the April following, he married Anna Maria Shipley, the eldest daughter of the bishop of St. Asaph, a lady to whom he had been long attached; who deserved his most affectionate esteem, who contributed in a very high degree to his domestic happiness, and who lamented his death with a most pungent and permanent grief. To the publications of sir William Jones, which we have already noticed, we shall here add an abridged history of the life of Nadir Shah, in English, and a history of the Persian language, intended to be prefixed to the first edition of his Persian grammar.

Sir William Jones embarked for India in the *Crocodile* frigate, and in April 1783 left his native country. He was now in his 37th year, with his faculties in full vigour, in possession of the appointment to which his views had been long directed, indulging the expectation of acquiring an ample independence, and having no reason to apprehend that the climate of India would be hostile to his constitution. He could not be sorry to abandon the political discussions, that divided his friends and alienated them from one another; and which must have produced mutual shyness and reserve between him and those to whom he was in other respects attached; and which served to agitate the whole country. He had with him a companion and friend, from whose society he could not but derive the greatest satisfaction and comfort, which kindred minds and united hearts are capable of receiving and communicating. In such society, and with ample resources in his own mind, a kind of temporary banishment from his country would be tolerable, the long voyage would not be tedious and uninteresting, and a settlement for important and beneficial purposes in a foreign land would be regarded without anxiety and aversion. In September 1783 he landed safely at Calcutta, and was received with cordial congratulations by those who were chiefly interested in his arrival. In the following December he entered upon his judicial functions, and at the opening of the sessions, delivered to the grand jury his first charge, which was concise, elegant, appropriate, and conciliatory. Scientific objects, during the intervals of professional duties, engaged his attention; and in order to combine the efforts of many in useful pursuits, he devised the institution of a society in Calcutta, similar in its plan and objects to those that have been established in the principal cities of Europe. See SOCIETY.

In the year succeeding that of his arrival, sir William Jones was attacked with a disorder which exhausted his strength, and threatened his valuable life. As soon, however, as he was able to undertake it, he projected a journey to Benares,

principally

principally with a view of opening sources of useful information. He proceeded by way of Moorshedabad, Jungpore, Bhagilpore, and Patna, to Benares. In the course of this journey his disorder once and again returned upon him, and seemed to excite in his mind an apprehension of its fatal termination. That this was the case we infer from a prayer which he composed on this occasion, and which is as follows :

"O thou bestower of all good! if it please thee to continue my easy tasks in this life, grant me strength to perform them as a faithful servant; but if thy wisdom hath willed to end them by this thy visitation, admit me, not weighing my unworthiness, but through thy mercy declared in Christ, into thy heavenly mansions, that I may continually advance in happiness, by advancing in true knowledge and awful love of thee, thy will be done!"

After a short residence at Benares, he returned by the Ganges to Bhagilpore; and in his journey from hence to Calcutta, he visited Gour, once the residence of the sovereigns of Bengal. In a letter written to a friend after his return, he says, "As we approached Calcutta we perceived the difference of climate, and thought of Bhagilpore with pleasure and regret." "I am just returned," says he, in another letter, "as it were from the brink of another world, having been absent near seven months; and reduced to a skeleton by fevers of every denomination, with an obstinate bilious flux at their heels. My health is tolerably restored by a long ramble through South Bahar, and the district of Benares." During this tour he wrote two tracts; one a little tale in verse, under the title of "The Enchanted Maid," or "Hindu Wife;" and the other, "A Treatise on the Gods of Greece, Italy, and India," afterwards presented to the Society, and published in the Asiatic Researches. The design of this work is to evince a resemblance, too strong to have been accidental, between the popular worship of the old Greeks and Italians, and that of the Hindus, and between their strange religion and that of Egypt, China, Persia, Phrygia, Phœnicia, and Syria, and even remoter nations. This resemblance, if it were established, would authorize, as sir William Jones conceives, an inference of a general union and affinity between the most distinguished inhabitants of the primitive world, at the time when they deviated, as they did too early deviate, from the rational adoration of the only true God. Sir William Jones, with his restored health, resumed his functions in the supreme court of judicature, and renewed the meetings of the society, interrupted by his absence. The society of sir William Jones was so much valued and sought for, and he was subject to so many intrusions, that, for the sake of enjoying the benefit of air and exercise, and of pursuing his literary pursuits without interruption, he made choice of a residence at Crishnagur, where the soil was dry, and the air pure. To the Asiatic Miscellany, a periodical work undertaken at Calcutta in 1785, but altogether unconnected with the Asiatic society, sir W. Jones contributed occasional compositions. Sir William, having long proposed making an excursion to Chatigan, the eastern limit of the British dominions in Bengal, executed his design after the recess of the court in the beginning of 1786, and repaired thither by sea. During his short residence at Chatigan, he found leisure, amidst other occupations, to peruse twice the heroic poem of Ferdosi, the Homer of Persia, supposed to contain 60,000 couplets. But the work to which his principal attention and labour were directed, was a translation of the Hindu and Mohammedan laws. Accordingly, in one of his letters, he says, "Sanserit and Arabic will enable me to do this country more essential service, than the introduction of arts, (even if I should be able to introduce them,) by procuring an accurate digest of Hindu and Mo-

hammedan laws, which the natives hold sacred, and by which both justice and policy require that they should be governed." Accordingly, he addressed a letter to the governor-general, lord Cornwallis, on this subject. The marquis Cornwallis considered the accomplishment of the proposed plan, as calculated to reflect the highest honour on his administration. With this sanction sir W. Jones entered on the execution of the work; and having carefully selected, from the most learned Hindus and Mohammedans, a sufficient number of persons duly qualified for the task of compilation, he traced the plan of the digest, prescribed its arrangement, and pointed out the MSS. from which it was to be formed. Although it is much to be regretted that sir W. Jones did not live to translate the digest of Hindu law, to the compilation of which he had devoted so much attention and labour; yet it is satisfactory to know, that his benevolent intentions have not been disappointed, and that Mr. H. T. Colebrooke, in the civil service of the East India company at Bengal, from motives of public spirit, and a laudable hope of distinction, has completed a translation of it with an ability which does him the highest credit. Sir W. Jones suggested an improvement in the police at Calcutta, so as to render it more efficient, and more conformable to the British constitution. His suggestions were adopted in an application to parliament, and confirmed by its sanction. The application of sir W. was incessant; and after what he calls his "seasoning," the state of his health allowed his devoting seven hours a day for four or five months in the year to professional engagements, and unremitting attention, during the vacations, to a complete knowledge of India, which was to be obtained only in the country itself, where it was his intention not to prolong his stay beyond the last year of the eighteenth century. Among other literary occupations which engaged his attention, he undertook the charge of editing the elegant poem of Hafezi, on the unfortunate loves of Laili and Majnon, an Arabian youth and princess. He published the book at his own expence, and appropriated the profits of the sale to the relief of insolvent debtors in the gaol at Calcutta. The business that was devolved upon him as president of the society at Calcutta, and in consequence of preparing the various excellent papers which he contributed to it, will be more particularly noticed in our account of that Society. In the year 1789, sir William presented to the public a translation of an ancient Indian drama, entitled "Sacotala," or the "Fatal Ring," exhibiting a very pleasing and authentic picture of old Hindu manners, and one of the greatest curiosities that the literature of Asia had yet brought to light. Calidas, the author of it, called by sir W. the Shakspeare of India, lived in the first century B. C., and wrote several other dramas and poetical pieces. The principal sources of amusement of which sir W. availed himself, was the conversation of the Pundits, with whom he talked freely, in the language of the gods (Sanserit), and botany, in which latter study, if it may be so called, he was much assisted by lady Jones. Their evenings were generally passed together, and devoted to the perusal of the best modern authors in the different languages of Europe. We find, however, from several of his letters, that he felt great anxiety concerning the debilitated state of her health, and that, painful as must be their mutual separation, he had engaged her promise to take her passage for Europe in January 1793. Such was her affectionate attachment to her husband, that she remained in India in opposition to the advice of her physicians, though she could entertain no reasonable expectation of recovering her health in the climate of that country. It was finally settled, however, that she should return to England; and it was his determination to follow

follow her in the ensuing season, hoping at that period to have discharged his engagements with the government of India, and intending to pursue his researches through Persia or China by a circuitous route, to his native country. Lady Jones embarked in December 1793. Soon after her departure, *viz.* in the beginning of 1794, sir William Jones published a translation of the Ordinances of Menu, comprising the Indian system of duties, religious and civil. In this work he had been long engaged from motives similar to those which had induced him to undertake the compilation of the digest; *viz.* to aid the benevolent intentions of the legislature of Great Britain, in securing to the natives of India the administration of justice, to a certain extent, by their own laws.

To those who entertain a just sense of the importance of the principles and the utility of the duties of religion, the following prayer, composed by sir W. Jones on the first day of the year 1782, about fifteen months before his embarkation for India, and more than twelve years before his death, will not be unacceptable:—"Eternal and incomprehensible *Mind*, who, by thy boundless *power*, before time began, createdst innumerable *worlds*, for thy *glory*, and innumerable orders of *beings* for their *happiness*, which thy infinite *goodness* prompted thee to desire, and thy infinite *wisdom* enabled thee to know! We, thy *creatures*, vanish into nothing before thy supreme majesty; we hourly feel our *weakness*; we daily bewail our *vices*; we continually acknowledge our *folly*; thee only we *adore* with awful veneration; thee we thank with the most fervent zeal; thee we *praise* with astonishment and rapture; to thy *power* we humbly submit; of thy *goodness* we devoutly implore protection; on thy *wisdom* we firmly and cheerfully rely. We do but open our *eyes*, and instantly we perceive thy divine existence; we do but exert our *reason*, and in a moment we discover thy divine *attributes*; but our eyes could not behold thy *splendour*, nor could our *minds* comprehend thy divine *essence*; we see thee *only* through thy stupendous and all-perfect *works*; we *know* thee *only* by that ray of sacred light which it has pleased thee to reveal. Nevertheless, if creatures too *ignorant* to *conceive*, and too *depraved* to *pursue*, the means of their own happiness, may, without preclusion, express their wants to their CREATOR, let us humbly supplicate thee to remove from us that *evil*, which thou hast permitted for a *time* to exist, that the *ultimate good* of all may be complete, and to secure us from that *vice*, which thou suffereest to spread snares around us, that the triumph of virtue may be more conspicuous. Irradiate our minds with all *useful truth*; instil into our hearts a spirit of *general benevolence*; give *understanding* to the foolish; *meekness* to the proud; *temperance* to the dissolute; *fortitude* to the feeble-hearted; *hope* to the desponding; *faith* to the unbelieving; *diligence* to the slothful; *patience* to those who are in *pain*; and thy celestial aid to those who are in *danger*: comfort the *afflicted*; relieve the *distressed*; supply the *hungry* with salutary food; and the *thirsty* with a plentiful stream. Impute not our *doubts* to indifference, nor our *slowness of belief* to *hardness of heart*; but be indulgent to our *imperfect nature*, and supply our *imperfections* by thy *heavenly favour*. 'Suffer not, we anxiously pray, suffer not *oppression* to prevail over *innocence*, nor the *might of the avenger* over the *weakness of the just*.' Whenever we address thee in our retirement from the vanities of the world, if our prayers are *foolish*, pity us; if *presumptuous*, pardon us; if *acceptable* to thee, grant them, all-powerful God, grant them; and, as with our *living voice*, and with our *dying lips*, we will express our submission to thy *decrees*, adore thy *providence*, and bless thy *dispensations*; so in all *future states*, to which we reverently hope thy *goodness* will raise us, grant

that we may continue *praising, admiring, venerating, worshipping* thee more and more, through *worlds* without number, and *ages* without end!" This prayer is undoubtedly the effusion of a truly pious mind, impressed with just sentiments of the Deity and of human nature; and though it does not express any explicit faith in the doctrines of Christianity, these sentiments are such as reason and experience suggest, and such as revelation expressly teaches us. It should also be recollected, that long before this prayer was written, sir W. Jones had demonstrated, as we have already observed, to his own satisfaction, that Jesus was the Messiah predicted by the prophets. We have also farther evidence, which no incredulity can contest, of his firm belief in the divine authority of the scriptures and divine mission of Jesus Christ. Of the sacred writings, he says, in a passage transcribed from his own MS. in his bible: "I have carefully and regularly perused these holy scriptures, and am of opinion, that the volume, independently of its divine origin, contains more sublimity, purer morality, more important history, and finer strains of eloquence, than can be collected from all other books, in whatever language they may have been written." It would indeed be endless to cite passages from his writings, which demonstrate his sentiments on the subject of revelation, and at the same time his earnest solicitude to impress his own belief on others. In this connection we cannot forbear transcribing a passage from the Memoirs of his biographer, which do honour to his judgment and his heart.

"In matters of eternal concern," says lord Teignmouth, "the authority of the highest human opinions has no claim to be admitted, as a ground of belief; but it may, with the strictest propriety, be opposed to that of men of inferior learning and penetration; and, whilst the pious derive satisfaction from the perusal of sentiments according with their own, those who doubt or disbelieve, should be induced to weigh, with candour and impartiality, arguments which have produced conviction in the minds of the best, the wisest, and the most learned of mankind."

After the departure of lady Jones, "whose society had sweetened the toil of application, and cheered his hours of relaxation," sir William mixed more in promiscuous society; "but his affections were transported with her to his native country," and, without doubt, led him to anticipate, with an anxiety blended with delight, the period which he had fixed in his own mind for leaving India, and renewing his intercourse with her, and with other friends. But Providence had otherwise determined. On the evening of the 20th of April, or nearly about that date, in 1794, he prolonged his walk to a late hour; in consequence of which he complained of aguish symptoms; but feeling no alarm he jocularly repeated an old adage; "An ague in the spring is medicine for a king." But his complaint, of which he had no apprehension, was that which is common in Bengal, *viz.* an inflammation in the liver. The medicines prescribed by the physician who attended him, and who soon discovered the nature of his disorder, were administered without effect. The progress of the disease was uncommonly rapid, and terminated fatally on the 27th of April 1794. His biographer found him, on the morning of that day, "lying on his bed in a posture of meditation; and the only symptom of remaining life was a small degree of motion in the heart, which after a few seconds ceased, and he expired without a pang or groan. His bodily suffering, from the complacency of his features and the ease of his attitude, could not have been severe; and his mind must have derived consolation from those sources where he had been in the habit of seeking it, and where alone, in our last moments, it can ever be found."

found." On the following day the funeral ceremony was performed, "with the honours due to his public station; and the numerous attendance of the most respectable British inhabitants of Calcutta evinced their sorrow for his loss, and their respect for his memory."

The following epitaph, evidently intended for himself, was written by sir William Jones, not long before his demise. It displays some striking features of his character, resignation to the will of his Creator, love and good-will to mankind; but it is modestly silent upon his intellectual attainments.

Here was deposited
the mortal part of a man,
who feared God, but not Death;
and maintained independence,
but sought not riches;
who thought
none below him, but the base and unjust,
none above him, but the wife and virtuous;
who loved
his parents, kindred, friends, and country,
with an ardour
which was the chief source of
all his pleasures and all his pains;
and who, having devoted
his life to their service,
and to
the improvement of his mind,
resigned it calmly,
giving glory to his Creator,
wishing peace on earth,
and with
good will to all creatures,
on the [Twenty-seventh] day of [April]
in the year of our blessed Redeemer
One thousand seven hundred [and ninety-four.]

By an unanimous vote of the Court of Directors of the East India Company, it was resolved, that a monument to his memory should be ordered, for the purpose of being erected in St. Paul's cathedral, with a suitable inscription; and that a statue of sir William Jones should be prepared at the expence of the company, and sent to Bengal, with directions for its being placed in a proper situation there. A society of gentlemen in Bengal, who had received their education at Oxford, subscribed a sum to be given, as a prize, for the best dissertation on his character and merits, by any of the students of that university; and the premium was adjudged to Mr. Henry Philpotts, A. M. Fellow of Magdalen college. Lady Jones testified her affection for sir William, and her desire to perpetuate his fame, by an elegant monument erected, at her expence, in the anti-chamber of University college, Oxford, and by the publication of his works in an elegant edition of six 4to. volumes; thus strictly conforming to his opinion, that "the best monument that can be erected to a man of literary talents, is a good edition of his works."

"In the short space of 47 years," says his biographer, "by the exertion of rare intellectual talents, he acquired a knowledge of arts, sciences, and languages, which has seldom been equalled, and scarcely, if ever, surpassed." Without considering him as a competitor in Grecian literature with a Porson or a Parr, he deserves to be ranked high among classical scholars; and "as a philologist, he could boast an universality in which he had no rival. His skill in the idioms of India, Persia, and Arabia, has perhaps never been equalled by any European; and his compositions on

oriental subjects display a taste, which we seldom find in the writings of those who had preceded him in these tracts of literature. The language of Constantinople was also familiar to him; and of the Chinese characters and tongue, he had learned enough to enable him to translate an ode of Confucius. In the modern dialects of Europe, French, Italian, Spanish, Portuguese, and German, he was thoroughly conversant, and had perused the most admired writers in those languages." The following transcript of a paper written by himself, will inform us, how far his knowledge of languages extended;

LANGUAGES:

Eight languages studied critically;
English, Latin, French, Italian,
Greek, Arabic, Persian, Sanscrit.

Eight studied less perfectly, but all intelligible with a dictionary;

Spanish, Portuguese, German, Runick,
Hebrew, Bengali, Hindi, Turkish.

Twelve studied less perfectly, but all attainable;

Tibetan, Pali, Phalavi, Deri,
Russian, Syriac, Ethiopic, Coptic,
Welsh, Swedish, Dutch, Chinese.

Twenty-eight languages.

In another memorandum, he mentions having read a grammar of the Russian and Welsh. The knowledge of languages, however, was, in sir W. Jones's estimation, inferior and subordinate to other objects. They were, in his possession, the keys of universal literature and science, and served, according to the use which he made of them, to unlock storehouses of ancient and modern treasures, for the amusement, instruction, and general benefit of mankind. The eleven discourses which he addressed to the Asiatic society, and to which we shall have occasion to refer under future articles, are specimens of the uses to which he applied them.

"A mere catalogue of the writings of sir William Jones," says his biographer, "would shew the extent and variety of his erudition; a perusal of them will prove, that it was no less deep than miscellaneous. Whatever topic he discusses, his ideas flow with ease and perspicuity, his style is always clear and polished; animated and forcible, when his subject requires it. His philological, botanical, philosophical, and chronological disquisitions, his historical researches, and even his Persian grammar, whilst they fix the curiosity and attention of the reader, by the novelty, depth, or importance of the knowledge displayed in them, always delight by elegance of diction. His compositions are never dry, tedious, nor disgusting; and literature and science come from his hands, adorned with all their grace and beauty. No writer, perhaps, ever displayed so much learning, with so little affectation of it." With regard to his law publications, it is said, that his "Essay on Bailements" was sanctioned by the approbation of lord Mansfield; and all his writings in this department shew, that he had thoroughly studied the principles of law as a science. As to his opinion of the British constitution, it appears from repeated declarations that occur in his letters, and particularly in his 10th discourse, delivered to the Asiatic society in 1793, that he considered it as the noblest and most perfect that ever was formed. With regard to his political principles, he was an enlightened and decided friend to civil and religious liberty. Like many others of the same principles, he entertained a favourable opinion of the French revolution at its commencement,

ment, and wished success to the exertions of that nation for the establishment of a free constitution : but subsequent events must have given him new views, not so much of the principles on which the revolution was founded, as of the measures which have been adopted by some of its zealous partizans. To liberty, indeed, his attachment was enthusiastic, and he never speaks of tyranny or oppression, but in the language of detestation. He dreaded, and wished to restrain every encroachment on liberty ; and though he never enlisted under the banners of any party, he always concurred in judgment and exertion with those who wished to render pure and permanent the constitution of his country. With this view he was a zealous advocate for a reformation in the representation of the country, as the only means of restoring the balance of the constitution, and in one of his letters to lord Althorp, he expressly declares, that "on the popular part of every government depend its real force, the obligation of its laws, its welfare, its security, its permanence." The last political publication of sir W. Jones is prior to the year 1783.

As a judge in India, his conduct was strictly conformable to the professions which he made in his first charge to the grand jury at Calcutta. "On the bench he was laborious, patient, and discriminating ; his charges to the grand jury, which do not exceed six, exhibit a veneration for the laws of his country ; a just and spirited encomium on the trial by jury, as the greatest and most invaluable right derived from them to the subject ; a detestation of crimes, combined with mercy to the offender ; occasional elucidations of the law ; and the strongest feelings of humanity and benevolence. His knowledge of the Sanscrit and Arabic eminently qualified him for the administration of justice in the supreme court, by enabling him to detect misrepresentations of the Hindu or Mohammedan laws, and to correct impositions in the form of administering oaths to the followers of Brahma and Mohammed. The inflexible integrity with which he discharged the solemn duty of this station will long be remembered in Calcutta, both by Europeans and natives.

Having through life directed his attention to various branches of literature and science, in all which he had made considerable proficiency, his last and favourite pursuit was the study of botany ; and this constituted the principal amusement of his leisure hours.

It might naturally be inquired by what arts or method he was enabled to attain that extraordinary degree of knowledge for which he was distinguished. His faculties were naturally vigorous and strengthened by exercise ; his memory, as we have before observed, was, from early life, singularly retentive ; his emulation was ardent and unbounded ; and his perseverance invincible. In India his studies began with the dawn ; and, with the intermission of professional duties, were continued throughout the day. Another circumstance, which has been exemplified in some other instances that might be mentioned, and which gave him peculiar advantage in the exercise of his talents, was "the regular allotment of his time to particular occupations, and a scrupulous adherence to the distribution which he had fixed ;" so that "all his studies were pursued without interruption or confusion." With sir W. Jones it was a favourite opinion, "that all men are born with an equal capacity for improvement." Accordingly sir I. Newton modestly declared, "that if he had done the world any service, it was due to nothing but industry and patient thought." Sir W. Jones having maintained the above-mentioned opinion in conversation with a friend, Thomas Law, esq. received the following unpromised reply :

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" Sir William, you attempt, in vain,
By depth of reason to maintain;
That all men's talents are the same,
And they, not nature, are to blame.
Whate'er you say, whate'er you write,
Proves your opponents in the right.
Left genius should be ill-defin'd
I term it *your superior mind*,
Hence to your friends 'tis plainly shewn,
You're ignorant of yourself alone."

Sir William Jones's Answer.

" Ah ! but too well, dear friend, I know
My fancy weak, my reason flow,
My memory by art improv'd,
My mind by baseless trifles mov'd.
Give me (thus high my pride I raise)
The ploughman's or the gardener's praise,
With patient and unceasing toil,
To meliorate a stubborn soil,
And say, (no higher meed I ask,)
With zeal hast thou perform'd thy task.
Praise, of which virtuous minds may boast,
They best confer, who merit most."

Besides the finished productions of sir William Jones's skill and labour, he had contemplated many more than he had executed : and for this reason, as well as many others, we cannot forbear regretting his premature death.

It is needless to add any thing in commendation of his private and social virtues. The independence of his integrity, his probity and humanity, and also his universal philanthropy and benevolence, are acknowledged by all who knew him. The compiler of this article joins with many others in a grateful and respectful remembrance of his disposition to perform acts of kindness ; and he has reasons, peculiar to himself, for regretting his premature death. In every domestic relation, as a son, a brother, and a husband, he was attentive to every dictate of love, and to every obligation of duty. In his intercourse with the Indian natives, he was condescending and conciliatory ; liberally rewarding those who assisted him, and treating his dependents as friends. His biographer records the following anecdote of a circumstance that occurred after his demise : "the Pundits who were in the habit of attending him, when I saw them at a public *durbar*, a few days after that melancholy event, could neither restrain their tears for his loss, nor find terms to express their admiration at the wonderful progress which he had made, in the sciences which they professed." Upon the whole, we may join with Dr. Parr, who knew his talents and character, in applying to sir William Jones his own words : "It is happy for us that this man was born."

Having attained, by the assiduous exertion of his abilities, and in a course of useful service to his country and mankind, a high degree of reputation ; and by economy that did not encroach upon his beneficence, a liberal competence, he was prepared, one would have thought, at the age of 47 years, to enjoy dignity with independence. His plans, and the objects of his pursuit, in the prospect of future life, were various and extensive ; and he would naturally indulge many pleasing ideas in the view of returning, at a fixed period, to his native country, and to beloved friends, who would anxiously wish for his arrival. Few persons seemed to be more capable of improving and enjoying prolonged life than sir William Jones ; and few persons seemed to be better prepared for a more exalted state of progressive improvement,

and of permanent felicity, than that to which the most distinguished and prosperous can attain within the regions of mortality.

We shall close this article with observing that lady Jones, since the demise of sir William, has presented to the Royal Society a collection of MSS. Sanscrit and Arabic, which he reckoned inestimable, and also another large collection of Eastern MSS.; of which a catalogue, compiled by Mr. Wilkins, is inserted in the 13th volume of sir William Jones's Works, 8vo. ed.

JONES, SIR THOMAS, lord chief justice of the Common Pleas in the reigns of Charles II. and James II., is celebrated for his reply to the latter, who consulted him on his dispensing power, and said he could soon have twelve judges of his opinion: sir Thomas answered, "Twelve judges you may possibly find, sir, but not twelve lawyers." He was author of Reports. Granger.

JONES, JEREMIAH, a learned English non-conformist divine in the eighteenth century, is supposed to have been born about the year 1693. It is not known where he received his grammar learning, but he was, at an early age, distinguished for his proficiency in useful knowledge. He pursued his academical studies under the tuition of his uncle, the Rev. Samuel Jones of Tewksbury, in Gloucestershire, from whose seminary many pupils were sent into the world, who became distinguished for their literature or rank in life. Among these were Butler, afterwards bishop of Durham; Secker, afterwards archbishop of Canterbury; and Samuel Chandler, minister of the Old Jewry meeting-house. When Mr. Jones had finished his course of academical learning, he settled with a congregation of Protestant Dissenters at Avening, in Gloucestershire. He obtained a high character for sound and very extensive learning; and he was popular as a preacher. Though a hard student and a profound scholar his manners were not severe or forbidding: he would even relax from his studies and join a party in his neighbourhood in the exercise of bowls. He died in 1724, when he was only in his thirty-first year. During his life he published "A Vindication of the former Part of St. Matthew's Gospel, &c." But his most valuable and important work, which he had prepared for the press before his death, but which was not published till the year 1726, was his "New and full Method of settling the Canonical Authority of the New Testament." The works of Mr. Jones remain as monuments of his learning, ingenuity, and indefatigable industry, and would have done credit to the assiduity and ability of a literary man of sixty. They were become exceedingly scarce, and bore a very high price, when, about ten years since, the conductors of the Clarendon press republished them. "Mr. Jones," observes Dr. Maltby, "has brought together, with uncommon diligence and judgment, the external evidence for the authenticity of the canonical books; and he has, with equal ability and fairness, stated his reasons for deciding against the apocryphal." Had his life been spared, Mr. Jones would have drawn up another and distinct volume on the apostolical fathers. Monthly Magazine.

JONES, WILLIAM, a worthy clergyman of the church of England, was born at Lowick, in Northamptonshire, in the year 1726. He laid a good foundation of grammar learning in the country, and when he was of a proper age he was admitted a scholar at the Charter-House in London, where he made a rapid progress in the Latin and Greek languages, and at the same time shewed a turn for philosophical pursuits. When he was about eighteen years of age, he was entered of University college, Ox-

ford, and in this seminary he pursued the usual course of studies with unremitted diligence. Here he adopted the Hutchinsonian opinions in theology and natural philosophy. Mr. Jones was admitted to the degree of B. A. in the year 1749, and was, in the same year, admitted to deacon's orders. In 1751, he was ordained priest, and in 1753, he published his "Full Answer to Bishop Clayton's Essay on Spirit," in which he endeavoured to support the cause of orthodoxy by an appeal to the religion and learning of heathen antiquity. His next work was entitled the "Catholic Doctrine of the Trinity," which was favourably received by the orthodox party. He now engaged in a course of experiments with the view of elucidating and establishing his favourite theory. In this he was liberally supported by friends who subscribed among themselves very large sums to enable him to purchase such an apparatus as he stood in need of. The result of his labours was "An Essay on the first Principles of Natural Philosophy," published in 1762. In the year 1764, he was presented by archbishop Secker with the vicarage of Berthsdon, in Kent. Here, to increase his income, he undertook the tuition of a few pupils, an office for which he was admirably qualified. In 1765, the archbishop presented him to the rectory of Pluckley, where he continued his plan of education, and at the same time discharged the pastoral duties with exemplary zeal and diligence. In the year 1769, he published "A Letter to a Young Gentleman at Oxford, intended for Holy Orders, containing some seasonable Cautions against Errors in Doctrine." From this time, to the year 1781, he published several other pieces, chiefly theological, and in the latter year he gave the world his "Physiological Disquisitions, or Discourses concerning the Natural Philosophy of the Elements." This work contains much instructive, and much fanciful matter, ingeniously applied in an attempt to investigate the causes of things, and to construct a theory of nature on the principles of the author's favourite system. His next publication was theological; it consisted of lectures on the figurative language of the Holy Scriptures, and the interpretation of it from the Scripture itself. This was published in 1788, and, in 1790, he gave the public two volumes of sermons on moral and religious subjects, which include discourses on natural history, delivered at an annual lecture at Shore-ditch church, of which the preacher is appointed by the Royal Society. In the year 1792 he employed his pen in the service of politics, and printed a two-penny pamphlet, entitled "A Letter from Thomas Bull to his Brother John, which was most industriously circulated throughout the kingdom by the friends of administration. Mr. Jones attempted to form a society "for the reformation of principles," but it did not succeed: he was the founder of the periodical publication entitled the "British Critic," and he edited a collection of tracts in two volumes, which had been originally published by Mr. Law, Mr. Norris, Dr. Horne, and others. This work was entitled "The Scholar armed against the Errors of the Time, or a Collection of Tracts on the Principles and Evidences of Christianity, the Constitution of the Church, and Authority of civil Government." In 1795 he published "Memoirs of the Life, Studies, and Writings of the Right Reverend George Horne, D.D. late lord bishop of Norwich," to the second edition of which he prefixed a concise exposition of Mr. Hutcheson's leading theological and philosophical opinions. His last publication was "A Discourse on the Use and Interpretation of some remarkable Passages of Scripture, &c." Shortly after this, he suffered most severely from a paralytic seizure, which at length, in February

1800, put an end to his life in the seventy-fourth year of his age. Mr. Jones's learning was very respectable, his attachment to truth was zealous and ardent, and his moral conduct highly exemplary. He delighted in doing good, and was a vigilant and affectionate pastor. He was, in addition to his other learning, a proficient in music, and composed ten church-pieces for the organ, and four anthems, which have been much admired. His works have been published in 12 vols. 8vo. See Gentleman's Magazine for 1800.

JONES, PAUL, a naval adventurer, was a native of Selkirk, in Scotland, but settling in America, he obtained, in 1775, the command of a ship under commodore Hopkins, and distinguished himself in several engagements, on which account he received a captain's commission. He then sailed to France, and being well acquainted with the coast of Ireland, and the northern part of England, he conceived the design of effecting a descent. He accordingly landed at Whitehaven, and did considerable mischief there. He afterwards sailed for Scotland, where he landed on the estate of the earl of Selkirk, and plundered his lordship's house of all the plate: he next took the Drake sloop of war, with which he went to Breft. After this he sailed round Ireland to the North sea, with three ships, viz. the Richard, Pallas, and Vengeance. Having committed great mischief on that coast, he fell in with the Baltic fleet, convoyed by the Serapis frigate, and another armed vessel, both of which he captured off Flamborough-head. For these services the king of France conferred on him the order of merit, and gave him a gold-hilted sword. We hear no more of his exploits after the conclusion of the American war. He died at Paris in 1792. Monthly Mag.

JONES, in *Geography*, a county of North Carolina, in Newbern district, bounded N. by Craven, and well watered by the river Trent and its tributary streams. It contains 4241 free inhabitants, and 1899 slaves. Its chief town is Trenton.

JONES, *St.*, a town of America, in Kent county, Delaware, containing 1586 inhabitants.

JONES'S *Creek*, a river of Pennsylvania, which runs into the Delaware. N. lat. 40° 58'. W. long. 75° 15'.

JONES'S *Island*, an island in Hudson's bay. N. lat. 61° 52'. W. long. 63°.

JONES'S *Key*, a small island in the Spanish Main, near the Mosquito shore, surrounded with rocks. N. lat. 15° 35'. W. long. 82° 27'.

JONES'S *Town*, in Pennsylvania. See WILLIAMSBURG.

JONESBOROUGH, a post-town of America, and chief town of Washington district, in Tennessee, and also the seat of the district and county courts, 26 miles from Greenville and 40 from Abingdon, in Virginia.—Also, the chief and post-town of Camden county, Edenton district, North Carolina; containing a court-house and a few dwelling houses.

JONESIA, in *Botany*, is a genus dedicated by Dr. Roxburgh to the memory of the celebrated sir William Jones, who, amongst the varied and univalled accomplishments he attained in almost every department of science, was by no means unskilled in botanical researches. Roxb. Afiat. Researches, v. 4. 355. Willd. Sp. Pl. v. 2. 287. (*Asjogam*; Hort. Malabar. v. 5. 117. t. 59.) Clafs and order, *Hep-tandria Monogynia*. Nat. Ord. ?

Ess. Ch. Calyx of two leaves. Corolla funnel-shaped, with a closed, fleshy tube; limb four-lobed. Nectary a little ring bearing the stamens, inserted into the throat of the tube of the corolla. Germen pedicellated. Pod-shaped like a cymitar, turgid, containing from four to eight seeds.

1. *J. pinnata*. Willd. (J. *Aloca*; Roxb. Afiat. Researches, v. 4. 355.) A native of the East Indies.—Thus

tree rises to the height of about 15 feet. Root whitish, covered with a blackish bark, inodorous, firmly fixed in the ground and spreading by means of numerous fibres. Leaves alternate, unequally pinnate, consisting of from four to six pair of oblong-lanceolate, smooth, shining, strong leaflets. Flowers making a dense cyme, odorous, of a fine yellow colour. Stamens long and slender, of a beautiful shining red, with dark purple tops. Style greenish-white, with a round tip.

We have seen a beautiful specimen of this plant which was gathered and preserved by lord Valentia in his Travels through India; and this authorizes us to say that the *Asjogam* of the *Hortus Malabaricus* is a most correct delineation of our *Jongfia*. It is found in gardens about Calcutta, where it grows to be a very handsome tree. The plants and seeds were originally brought from the interior of the country, where it is indigenous.

JONGLEURS, musicians, players on instruments, in the infancy of French poetry, who attached themselves to the troubadours or provincial poets.

The history of the French theatre informs us that a kind of merry-andrews were thus called that accompanied the troubadours, who began to flourish about the beginning of the eleventh century. The term jongleur seems to be a corruption of the Latin word *joculator*, in French *joueur*, and in English player on an instrument. Mention is made of the jongleurs from the time of the emperor Henry II., who died in 1056. As they played upon different instruments, they associated with the troubadours and singers, to execute the works of the first, and thus, in their company they gained admission into the palaces of kings and princes, and drew from them magnificent presents. Some time after the death of Joan I. queen of Naples and Sicily, and countess of Provence, which happened 1382, all those of the profession of troubadours and jongleurs, separated into two different classes of actors. Some, under the ancient name of *troubadours*, joined singing to instruments, or the recitation of voices; others simply took the name of players, or *joculators*, as they were named in their certificates.

About the year 1330, the minstrels of Paris, including the jongleurs, formed themselves into a company, and obtained a charter. The police frequently repressed their licentiousness, and regulated their conduct: Philip Augustus banished them the first year of his reign; but they were recalled by his successors, and united under the general name of *menftraudie*, minstrelsy; having a chief appointed over them, who was called *king of the minstrels*. Lewis IX. exempted them from a tariff or toll at the entrance into Paris, on condition that they would sing a song and make their monkies dance to the tollman, perhaps to prove their title to such indulgence; and hence arose the well-known proverb: *Payer en gambades et en monnoie de finge*.

The associated minstrels inhabited a particular street, to which they gave the name, which it still retains, of *St. Julien des Menfriers*. It was here that the public was provided with musicians for weddings and parties of pleasure; but as a greater number of them usually attended on such occasions than were ordered, and all expected to be paid the same price, William de Germont, provost of Paris, in 1331 prohibited the jongleurs and jongleresses from going to those who required their performance in greater numbers than had been stipulated, upon a severe penalty. In 1395 their libertinism and immoralities again incurred the censure of government, by which it was strictly enjoined that they should henceforth, neither in public nor private, speak, act, or sing any thing that was indecorous or unfit for modest eyes and ears, upon

pain of two months imprisonment, and living on bread and water.

Though the word *minstrel*, in English, is confined to strolling musicians, players on instruments; yet the term *jongleur*, in old French, included buffoons, fortune-tellers, slight of hand, tumblers, &c. besides *violars*, or performers on the violle or viol; *juglars*, or flute players; *musars*, or players on other instruments; *comiques*, or comedians.

All these, at last, assumed the name of *jongleurs*, as the most ancient, and the women who followed this profession were denominated *jongleures*. They settled at Paris in one particular street, which thence was called "la rue des jongleurs," and which is still called the street of "St. Julien des Menétriers." In that street people used to apply for performers on festivals, and for parties of pleasure.

By an ordinance of William of Clermont, provost of Paris, 14th Sept. 1395, the *jongleurs* were forbidden to utter, represent, or sing in public places, or elsewhere, any thing that would occasion scandal, on pain of fine and two months imprisonment. Since that time we hear no more of them, except their dancing and performing tricks with swords and other weapons. These were called *batalores*, in Fr. *bateleurs*, merry-andrews; and, at length, tumblers and rope-dancers. See MINSTREL.

IONIA, in *Ancient Geography*, so called from the Ionians, who inhabited this part of Asia Minor, was bounded on the N. by *Æolia*; on the W. by the *Ægean* and *Icarian* seas; on the S. by *Caria*; and on the E. by *Lydia* and part of *Caria*. It lies between the 37th and 40th degrees of north latitude, but its extent in longitude, which has not been accurately determined, was inconsiderable. The most remarkable cities of *Ion* were *Phocæa*, *Smyrna*, *Clazomenæ*, *Erythræ*, *Teos*, *Lebadus*, *Colophon*, *Ephesus*, *Priene*, and *Miletus*. The islands of *Chios* and *Samos* were likewise inhabited by the Ionians, and belonged to their confederacy. See the next article.

IONIANS, constitute a class of people among those who were the most celebrated of the Greeks. They derived their origin from the Hellenes, who were so called from *Hellen*, the son of *Deucalion*, and who formed a small tribe in *Thessaly*: and from *Dorus*, *Æolus*, and *Ion*, his more remote descendants, the Hellenes were discriminated by the names of *Dorians*, *Æolians*, and *Ionians*. The name of the latter was gradually lost in the more illustrious appellation of *Athenians*, settled in the less barren parts of *Attica*. (See *ATTICA* and *ATHENS*.) When the *Heraclidæ* took possession of the *Peloponnesus*, 80 years after the taking of *Troy*, B.C. 1104, a signal revolution took place in several states of *Greece*; and those tribes, which occupied the islands and coasts of *Asia Minor*, were either expelled by their conquerors, or migrated to seek new settlements. The *Æolians* were the first of these emigrants, they crossed the *Hellepont* 88 years after the taking of *Troy*, B.C. 1016, and established themselves in the country, afterwards called *Æolis* or *Æolia*. According to *Blair's tables* their migration took place before the return of the *Heraclidæ*, in the year B.C. 1124. (See *ÆOLIS*.) Upon the death of *Codrus*, B.C. 1070, the monarchical form of government was abolished in *Athens*, and succeeded by the administration of *Archons*. Dissatisfied probably with this change, *Neleus* and *Androclus*, younger sons of *Codrus*, determined to leave their country. Accordingly being joined by many refugees, and *Athenian* citizens, who complained that *Attica* was too narrow and barren for maintaining the increasing number of its inhabitants, sailed to *Asia Minor*, and, expelling the ancient inhabitants, seized the central and most beautiful portion of the *Asiatic* coast.

Their colonies were gradually diffused from the banks of the *Hermus* to the promontory of *Posideion*. They afterwards took possession of *Chios* and *Samos*; and all these countries were united by the common name of *Ion*, to denote that the Ionians composed the most numerous division of the colony. The *Ionic* migration is fixed in *Blair's tables* at the year B.C. 1044, 60 years after the return of the *Heraclidæ*; but others refer it to the year B.C. 1055. The last tribe which emigrated was that of the *Dorians*, who, in the year B.C. 944, sailed to the islands of *Rhodes* and *Crete*, already peopled by *Doric* tribes; while others transported themselves to the peninsula of *Caria*, which, in honour of their mother country, received the name of *Doris*. (See *DORIS*.) In consequence of this establishment, which was formed 240 years after the *Trojan* war, the western coast of *Asia Minor* was planted by the *Æolians* in the north, the *Ionians* in the middle, and the *Dorians* in the south. The *Ionians*, in particular, settled in a country of great extent and fertility, enjoying the most delicious climate, and peculiarly adapted to a commercial intercourse with the most improved nations of antiquity. Thus favoured, they silently flourished in peace and prosperity, till their growing numbers and wealth excited the avarice or jealousy of the powers of *Asia*. They were successively conquered by the *Lydians* and *Persians*, but never thoroughly subdued. "Having imbibed," says *Dr. Gillies* (*Hist. of Anc. Greece*, vol. 1. chap. 3.) "the principles of European liberty, they spurned the yoke of Asiatic bondage. In their glorious struggles to reassume the character of freemen, they solicited and obtained the assistance of their *Athenian* ancestors, and occasioned that memorable rivalry between the *Greeks* and *Persians*, which having lasted two centuries, ended in the destruction of the *Persian* empire. In this illustrious contest, the first successes of the *Greeks* against enemies far more powerful, and incomparably more numerous than themselves, inspired them with an enthusiasm of valour. Their exploits merited not only praise but wonder; and seemed fit subjects for that historical romance, which, in the progress of literature, naturally succeeds to epic poetry." In process of time the *Ionians*, possessing the delightful country above-mentioned, together with the mouths of great rivers, having before them convenient and capacious harbours, and behind, the wealthy and populous nations of *Asia*, whose commerce they enjoyed and engrossed, attained such early and rapid proficiency in the arts of navigation and traffic, as raised the cities of *Miletus*, *Colophon*, and *Phocæa*, to an extraordinary pitch of opulence and grandeur. Their population increasing with their prosperity, they diffused new colonies every where around them. Having obtained footing in *Egypt*, in the eighth century before Christ, they acquired, and thenceforth preserved, the exclusive commerce of that ancient and powerful kingdom. Their territories, though in their greatest breadth compressed between the sea and the dominions of *Lydia* to the extent of scarcely forty miles, became not only flourishing in peace, but formidable in war. With the utmost industry and perseverance they improved and ennobled the useful or elegant arts, which they found already practised among the *Phrygians* and *Lydians*. They incorporated the music of those nations with their own. Their poetry far excelled whatever *Pagan* antiquity could boast most precious. They rivalled the skill of their neighbours in moulding clay and casting brads. They appear to have been the first people who made statues of marble. The *Doric* and *Ionic* orders of architecture perpetuate, in their names, the honour of their inventors. Painting was first reduced to rule, and practised with success among the *Greeks*; and we may be assured, that, during

the seventh century before Christ, the Ionians surpassed all their neighbours, and even the Phœnicians, in the arts of design, since the magnificent presents which the far-famed oracle of Delphi received from the ostentation or piety of the Lydian kings, were chiefly the productions of Ionian artists. In the following century Ionia gave birth to philosophy; and both science and taste were diffused from that country over Greece, Italy, and Sicily. (Gillies, *ubi supra*.) The Ionians, however, soon degenerated from the valour of their ancestors, and became a superstitious, effeminate, and voluptuous people, inasmuch that, in the time of Herodotus, they were looked upon as quite unfit for any military service. They and the Greek colonies settled in Asia, enjoyed their liberties, and lived, according to their own laws, from the time of their migration in the reign of Cræsus, king of Lydia, to whose superior power they were forced to submit, after having baffled all the attempts of his predecessors. Before Cyrus invaded Lower Asia, he earnestly intreated the Ionians (B. C. 547) to share the glory of his arms; but having lived at ease under the mild government of Cræsus, they preferred their allegiance to him before the friendship of another unknown master. Accordingly they opposed him when he first invaded Lydia, and rejected the advantageous proposals of that prince; but after the defeat of Cræsus they sent ambassadors to the conqueror, offering submission upon the terms which had been formerly granted them by Cræsus. Cyrus having heard them with attention, answered them by the following apologue: "A piper seeing numerous shoals of fishes in the sea, and imagining he might entice them ashore by his music, began to play; but finding his hopes disappointed, he threw a net into the water, and drew a great number to the land. When he saw the fish leaping on the ground, since you would not dance, said he, to my pipe before, it is unnecessary for you now to dance, since I have ceased to play." They now perceived that if they would escape the rigour of servitude, they must owe their safety to the strenuous exertions of a brave defence, not to the clemency of Cyrus. The Lacedæmonians, to whom they applied, interposed in their behalf, and remonstrated with Cyrus against his design of subduing the Asiatic Greeks: but without effect. The Ionians had previously formed a powerful confederacy with the other states. Cyrus, having ordered Cræsus into captivity, was eager to return towards the East to complete his conquests in Upper Asia; and he committed the reduction of all the countries of Lower Asia to the skill of his lieutenant, Harpagus (B. C. 539.) This general, in a few months, completely executed his commission, and made himself master of all the countries in Lower Asia, possessed by either Greeks or Barbarians. In the reign of Darius Hystaspes, they made an attempt to recover their ancient liberty, and maintained a war against the whole power of the Persian monarchy for six years: but they were constrained to submit, and punished with great severity for their presumption in endeavouring to regain their rights. The Ionians assisted Xerxes in his expedition against Athens with 100 ships; but they were persuaded by Themistocles to abandon the Persians, and their flight contributed not a little to the famous victory gained by the Athenians at Salamis. A similar expedient was resorted to at Mycale, so that few Persians escaped slaughter. The Lacedæmonians were so pleased with their behaviour on this occasion, that they proposed to transplant them out of Asia into Greece; but they declined accepting the proposal. On the conclusion of the peace between the Greeks and Persians, which happened in the reign of Artaxerxes, one of the articles

sworn to by both parties was, that all the Greek states of Asia should be made free, and allowed to live according to their own laws. The Ionians, thus delivered from the Persian yoke, formed an alliance with the Athenians; but were treated by them rather like subjects than allies. Their fortune was various; at one time subject to the Persians, and at another time revolting from them, till they were at length delivered by Alexander, who restored all the Greeks in Asia to the enjoyment of their ancient rights and privileges. After the death of Alexander, they fell under the power of the kings of Syria, till the Romans obliged Antiochus III. surnamed the Great, to grant the same liberty to the Greek colonies in Asia, which they had procured for the Greek states in Europe. On this occasion, most of the free cities entered into an alliance with Rome, and enjoyed that kind of liberty which the Romans used to grant; till they were again brought under subjection by the famous Mithridates, king of Pontus, whom they joined against the Romans. By his order they massacred, without distinction, all the Romans and Italians whom trade, or the salubrity of the climate, had drawn into Asia. Nor would they suffer even their famous temple of Diana to be an asylum to those who fled to it for refuge. Upon Sylla's arrival in Asia they abandoned Mithridates, and declared for the Romans. Sylla, having routed all the armies of Mithridates, and reduced all the Lesser Asia, revenged on the Asiatics the death of so many thousand Romans, whom they had inhumanly murdered in compliance with the savage orders of Mithridates, by depriving them of their liberty, and laying such heavy taxes and fines on their cities, as reduced them to beggary. The city of Ephesus was treated with the greatest severity; Sylla having suffered his soldiers to live there at discretion, and obliged the inhabitants to pay every officer 50 drachmas, and every soldier 16 denarii a-day. The whole sum which the revolted cities of Asia paid Sylla, amounted to 20,000 talents, that is, three millions eight hundred and seventy-five thousand pounds sterling; for the raising of which they were forced to sell not only their moveables, but even a great part of their lands. This was a most fatal blow to Asia; nor did the inhabitants ever after recover their ancient splendour, notwithstanding the favour shewn them by many of the emperors, under whose protection they enjoyed some shew of liberty. Gillies's *Hist. of Greece*. Anc. Un. Hist. vol. vi.

IONIC ORDER, an order of *Architecture*, which owes its invention to the people of Ionia, and was first employed in the temple of Diana, at Ephesus. This order is an improvement upon the Doric; the column is more slender and graceful, and, according to Vitruvius, is intended to describe the delicate proportions of the female figure, as the Doric indicates the stronger characteristics of the male. This idea, he says, is preserved throughout its decorations: the capital having two spirals, peculiar to this order, on either side, in imitation of ringlets of hair projecting from the head; the cymatium indicates the locks hanging over the forehead; while the mouldings of the base represent the turn and shape of the shoes worn by women in the age when the order was invented. Its general appearance is simple, though graceful and majestic; and as forming a medium between the masculine Doric and the virginal slenderness of the Corinthian; it has been, in figurative language, compared to a sedate matron in decent, rather than in rich attire.

This order may be used in all places consecrated to peace and tranquillity; accordingly we meet with it in churches, colleges, and libraries; and the ancients used it in temples dedicated.

IONIC ORDER.

dedicated to Diana, Juno, Apollo, Fortune, Concord, &c. It may also be employed in palaces, halls of justice, and private houses.

In erecting the temple at Ephesus, the bold characteristics of the original hut were omitted; and instead of the triglyphs and mutules of the Doric order, the more delicate dentils of the Ionic were substituted. The omission of these large members obviates the difficulty experienced in the execution of the Doric in confined situations, particularly in internal angles.

The Ionic base, according to Vitruvius, consists of a torus and two scotia, with astragals between them. In the Athenian Ionics, the base consists of two tori, with a scotia or trochilus between them, and two fillets, each separating the scotia from the torus above and below. The fillet above the torus generally projects as far as the extremity of the upper torus, and the lower fillet beyond it. The scotia is very flat, and its section forms an elliptic curve, joining the fillet on each side. The tori and scotia are nearly of equal heights. In the Ionic temple on the Illysus, a bead and fillet are employed above the upper torus, joining the fillet to the scape of the column. In this temple, and in that of Erechtheus, the upper torus is fluted, except the lower part, where it joins the upper surface of the fillet, which is preserved entire. The bases of the antæ of the latter temple are also recessed. In the temple of Minerva Polias, the upper scotia is enriched with a guilloche, and the bases of the antæ are striated, the flutes being separated from each other by two small cylindric mouldings of a quadrantal section, which join each other at their convexities. This is the true Attic base, it was invented by the Athenians, and is the most favourite base both with the ancients and moderns, being lighter in its upper part than the Ionic, more pleasing in its contour, and elegant in its general appearance. The Romans did not confine the use of this base to their Ionics, but very frequently adopted it in the Corinthian and Composite orders. They, however, differed very much from the Greeks in the proportions they assigned to it; for they always make the upper torus of a less height than the lower one, have both tori plain, and give the scotia a much greater concavity. The bases of the Ionic and Corinthian orders on the Coliseum, the Ionic on the theatre of Marcellus, and the temple of Fortuna Virilis at Rome, have nearly the same proportions with those described by Vitruvius. In the temples of Minerva Polias, at Priene, and of Apollo Didymæus, near Miletus, the Ionic bases consist of a large torus, three pair of astragals, separated by two scotia inverted towards each other; the upper pair of astragals lying below the torus. In the former temple the torus is elliptical, and separated from the shaft by the intervention of an astragal. The under part of this torus is also fluted, and there is a flute cut in the upper part near the head. In the latter temple, the upper torus is plain, of a semi-circular section, with a narrow fillet between each head of every pair. The base of the Asiatic Ionics differ very little from that of Vitruvius, except that they have the scotia inverted towards each other, which gives a greater variety in the profile than when both stand in the same position. The Ionians also sometimes used the Attic base, as may be seen in the temple of Bacchus, at Teos.

The Ionic shaft is sometimes plain, but more frequently striated into 24 flutes, with an equal number of fillets.

The volute is a distinguishing feature in this order, and is variously executed. In all the Athenian Ionics, and in the temple of Minerva Polias, at Priene, the lower edge of the canal between the volutes is formed into a graceful curve,

bending downwards, and coiling round the spirals which form the volutes. The volutes of the capitals of the temples of Minerva Polias, and of Erechtheus at Athens, exceed every other remain of antiquity for singularity and beauty: each volute has a double channel, formed by two distinct spiral borders, which leave between them a deep recess or groove, diminishing gradually in its breadth till it is entirely lost on the side of the eye. In the former temple, the shaft is terminated with a single fillet below the lower edges of the volutes; and in the latter, with a fillet and astragal. In both, the Colorino is decorated with wood-bines, formed alike in the alternate courses, but differing in the adjoining ones. The upper annular moulding of the column is of a semi-circular section, embellished with a guilloche. In the temple of Bacchus, at Teos, the great theatre at Laodicea, and in all the Roman Ionics, the connecting channel of the volutes has no border on the lower edge, but is terminated with a horizontal line, which falls a tangent to the beginning of the second revolution of each volute. When columns are given to the flanks as well as the front of a building, the angular volute of the outside column is double, and made to face both the contiguous sides of the building; examples of which are to be met with in the temples of Fortuna Virilis at Rome, of Minerva Polias at Priene, of Bacchus at Teos, and of Erechtheus, and the temple on the Illysus, at Athens. Sometimes the capitals of all the columns are made to face the four sides of the abacus alike, as in the temple of Concord at Rome, from which example the Scammozian capital, as it is called, was first imitated by Michael Angelo, as may be seen in the Conservatorium, embellished by him with this capital during the pontificate of Paul III. before Scamozzi was known as an architect.

Both Grecian and Roman Ionic capitals have the echinus, astragal, and fillet. The echinus is uniformly cut into eggs, surrounded with borders, and tongues between every two borders. The astragal consists of a row of beads, two large and two small alternately. In all the Roman buildings, except the Coliseum, these mouldings are cut alike, differing only in the taste of the foliage.

In the temple of the Illysus, the architrave consists of one broad fascia, crowned with a cymatium. The parts of the cornice visible in front are the corona, with its cymatium and sima. The cymatium of the frieze is wrought under the cornice, and consists of a sima reversa, and bead below it. The height of the architrave is about two-fifths of the entablature; and by dividing the upper three-fifths into five other parts, the plain part of the frieze will be found to occupy three, and the cornice two parts. The architraves of the temples of Erechtheus and Minerva Polias at Athens, consist of three fascia and cymatium; the cymatium of the frieze being mostly wrought under the corona. Divide the height of the entablature, from the bottom of the lower fascia to the top of the cymatium of the corona, into 19 parts, and the architrave, with the part of the frieze that is seen, will be found to occupy 16, viz. eight for the architrave, and as many for the frieze; the other three parts will comprise the corona, including the larimer and cymatium.

In general, the height of the entablature may be two diameters; but in buildings requiring grandeur as well as elegance, it should not be less than a fourth.

The Asiatic Ionic differs materially from the European or Attic. In the former, most of the remains are without the friezes, so that the height of the entablatures cannot be precisely determined, notwithstanding that the architraves and cornices have been accurately measured. In the great theatre

theatre at Laodicea, however, this order has a pulvinated frieze, whose height is rather less than a fifth of that of the whole entablature. In the temples of Bacchus at Teos, and of Minerva Polias at Priene, the architraves are divided into three *faciæ* below the cymatium. In all the Asiatic specimens, the crowning moulding is a *simæ recta*, less in projection than in height; the dentils are constantly used, and their height is about a mean proportion between that of the *simæ recta* and that of the *larimer*; it being always greater than the height of the *larimer*, and less than that of the *simæ recta*. The cymatium of the denticulated band being wrought almost entirely out of the *foffit* of the corona, recessed upwards, its elevation is almost concealed from the eye of the beholder. The height of the cornice, from the top of the *simæ*, to the lower edge of the dentils, is about equal to that of the architrave. The altitude of the frieze, exclusive of its cymatium, or upper mouldings, may be taken at about a fourth of the whole entablature. To give it a greater proportion, would make the entablature too high for the columns.

In the Ionic examples of Greece, there is a constant ratio between the upper part of the cornice, from the lower edge of the corona upwards, and the height of the entablature, which is nearly as two to nine. This is a very distinct division, occasioned by the great recess of the mouldings under the corona; for which reason the cornice is not reckoned too clumsy, though the whole denticulated band and cymatium of the frieze be introduced below it; and this seems to be the characteristic difference between the European and Asiatic Ionics. This order, as found in Ionia, is complete; while the specimens of Attica want the dentil band, though in other respects they are very beautiful. But the most exquisite remains we have of this order, are to be found in the temple of Minerva Polias at Priene, which, for beauty of proportion and elegance of decoration, exceeds every other specimen.

Plate XXVIII. exhibits a representation with the proportions of this magnificent example, the proportions being marked upon the outline.

Plate I. exhibits in *figs.* 1, 2, 4, 5, different bases applicable to the Ionic orders, *fig.* 1. from the temple of Jupiter Olympius; *fig.* 2. from that of Minerva Polias, at Athens; *fig.* 4. an Ionic base according to Vignola; *fig.* 5, elevation of the capital of the temple of Minerva Polias, at Athens. This is perhaps the most elegant specimen that is to be found of the Ionic capital.

IONIC *Architrave, base, capital, cornice, entablature, frieze, pedestal.* See the substantives.

IONIC *Dialect*, in *Grammar*, a manner of speaking peculiar to the people of Ionia.

At first, it was the same with the ancient Attic; but passing into Asia, it did not arrive at that delicacy and perfection to which the Athenians attained; instead of that it rather degenerated in Asia Minor; being corrupted by the admission of foreign idioms.

In this dialect it was that Herodotus, Hippocrates, and Galen wrote. See DIALECT.

IONIC *Sect* was the first of the ancient sects of philosophers, and was called the Ionic school.

The founder of this sect was Thales, (see his article,) who, being a native of Miletus, in Ionia, occasioned his followers to assume the appellation of Ionic.

It was the distinguishing tenet of this sect, that water was the principle of all natural things.

This is what Pindar alludes to in the beginning of his first Olympic Ode.

But Thales could not mean to assert, that water is the

efficient cause of the formation of bodies; but merely, that this is the element from which they are produced. It is not improbable, that by "water," he meant to express the same idea, which the Cosmogonists expressed by the word chaos, the notion annexed to which was that of a turbid and muddy mass, from which all things were produced. (See CHAOS.) It has been much debated, whether Thales, besides the passive principle in nature, which he called water, admitted an intelligent, efficient cause. Those who have maintained the affirmative lay great stress upon sundry aphorisms concerning God, which are ascribed by the ancients to this philosopher, particularly the following; that God is the most ancient being, who has neither beginning nor end; that all things are full of God; and that the world is the beautiful work of God. They also allege the testimony of Cicero, who says, (*De Nat. Deor.* l. i. c. 10.) that Thales taught, that water is the first principle of all things, and that God is that mind which formed all things out of water. Those who are of the contrary opinion, urge that the ancients, and even Cicero himself, though not very consistently, ascribe to Anaxagoras the honour of having first represented God as the intelligent cause of the universe, and they add that the evidence in favour of Thales rests only upon traditional testimony, which may be opposed by other authorities. (*Elem. Alex. Strom.* l. ii. p. 364. *Aug. de Ca. Dei.* l. viii. c. 2. *Euseb. Prep. Evang.* l. i. c. 7.) The truth may probably be this; that Thales, though he did not expressly maintain an independent mind as the efficient cause of nature, admitted the ancient doctrine concerning God, as the animating principle or soul of the world. Concerning the material world, Thales taught, that night existed before day, which doctrine he probably borrowed from the Grecian theogonies, which placed Night, or Chaos, among the first divinities. He held that stars are fiery bodies; that the moon is an opaque body illuminated by the sun, and that the earth is a spherical body, placed in the middle of the universe. In mathematics, Thales is said to have invented several fundamental propositions, which were afterwards incorporated into the elements of Euclid; particularly the following theorems, *viz.* that a circle is bisected by its diameter; that the angles at the base of an isosceles triangle are equal; that the vertical angles of two intersecting lines are equal; that, if two angles and one side of one triangle be equal to two angles and one side of another triangle, the remaining angles and sides are respectively equal; and that the angle in a semicircle is a right angle. Of his knowledge of the principles of mensuration, and consequently of the doctrine of proportion, his instructions to the Egyptian priests for finding the height of their pyramids, are a sufficient proof. His method was this; at the termination of the shadow he erected a staff perpendicular to the surface of the earth; and thus obtained two right-angled triangles, which enabled him to infer the ratio of the height of the pyramid to the length of its shadow, from the ratio of the height of the staff to the length of its shadow. (*Laert.* l. i. § 24, 25. 27. *Proclus in Euclid.* l. i. *Plin. Hist. Nat.* l. xxxviii. c. 17.) Astronomy, as well as mathematics, seems to have received considerable improvement from Thales. He was able to predict an eclipse, though probably with no great degree of accuracy as to the time; for Herodotus, who relates this fact (l. i.), only says, that he foretold the year in which it would happen. He taught the Greeks the division of the heavens into five zones, and the solstitial and equinoctial points, and approached so near to the knowledge of the true length of the solar revolution, that he corrected their calendar, and made their year to contain 365 days. The seeds of natural science, which had been sown by.

by Thales, the father of the Grecian philosophy, were successfully cherished in their growth by Anaximander. He was followed in the Ionic school by Anaximenes, Anaxagoras, Diogenes Apollonietes, and Archelaus of Miletus, who may be considered as the last preceptor in the original Ionic school. See the several biographical articles. Socrates is commonly reckoned to have been the disciple of Archelaus. He was himself the founder of a school; for an account of which see *SOCRATES* and *SOCRATIC school*. The inferior sects in the Ionic succession were the *Cyrenaic*, the *Megaric*, and the *Eliac* or *Eretriac*. Those of higher celebrity were the *Academic* and the *Cynic*, from which latter arose the *Peripatetic* and the *Stoic*, which was the last branch of the Ionic school. See each of these articles.

The Ionic philosophy, notwithstanding the celebrity of its first professors, soon failed in the Grecian schools, and never afterwards recovered its ancient reputation and authority. This was owing to the suspicion of impiety under which it lay in Athens, to the early growth of new branches from the Socratic stock, and to the rise and spread of the Eleatic and Epicurean philosophy. In later times, the universal prevalence of the Platonic and Aristotelian systems precluded every idea of reviving the physiology of the Ionic school, till, in the 17th century, an attempt was made for this purpose by Berigard, but in a manner so circumspect and covert, that this philosopher was commonly ranked among the followers of Aristotle, and even supposed to be deeply tinctured with the impiety of his system. Claud Berigard was born at Molena in Spain in the year 1592, and studied first at Aix, then at Paris, and afterwards at Pisa, where, by the favour of the duke of Tuscany, he was appointed professor of mathematics and botany. His fame, which spread through Italy, induced the republic of Venice, in the year 1640, to appoint him, with a liberal stipend, professor of philosophy in Padua. Here he remained till his death in 1668. In the year 1632, he published, under a fictitious name, a work entitled "*Dubitationes in Dialogos Galilæi de Terræ Immobilitate*;" but his principal work is his "*Circuli Pisani*," in which he relates the disputations which were held at Pisa, on the physical writings of Aristotle, and gives his own sentiments upon them. Berigard, having perceived the folly of that implicit obedience which had been long paid to the authority of the stagyrite, became a determined opponent of his philosophy, not openly, which would have been hazardous, but in the indirect and concealed method of dialogue. Adopting the Ionic system, he framed a disputation between the Aristotelians and Ionics, in which he made Aristæus refute the reasoning of Charileus, and support the doctrine of the Ionic school, by an appeal to experience, as well as by many ingenious arguments. However he saw, and confessed, that both the Peripatetic and Ionic systems were materially defective, and in many particulars erroneous; and therefore much inclined to philosophical scepticism. Nevertheless he endeavoured to prove, that the followers of Thales approached nearer to truth than those of Aristotle, the dangerous tendency of whose tenets, in several particulars, he clearly exposed. Among the doctrines of the stagyrite, those which he chiefly reprobated were the following, *viz.* that the world is eternal; that the residence of the first mover is confined to the outer sphere of the universe; that neither the world, nor any being, can properly be said to have been created; and that there is one soul common to the whole human species. In opposition to these opinions, which Berigard rejected as capital errors, from which many others must arise, he maintained the Ionic doctrine of the eternity of the primary particles of matter; of a forming

and presiding mind, by whose agency these particles were collected into distinct bodies; and of the combination and dispersion of these as constituting the formation and dissolution of all things. In short, Berigard seems to have prepared the way for the revival of the Atomic system of Epicurus, which was, soon after this time, restored and defended by Gassendi. Brucker's *Hist. of Philos.* by Enfield. Bayle.

IONIC Transmigration was heretofore a celebrated epocha, which took its rise from the retreat of the Athenian colonies; who, upon the death of Codrus, put themselves under the command of his son Neleus, and established the twelve cities of Ionia in Asia.

Those colonies, according to Eratosthenes, were established fifty years after the return of the Heraclidæ; and, according to Marsham, seventy-seven years after the taking of Troy. See *IONIA*.

IONIC, or *IONIAN Mode*, in the *Ancient Greek Music*. The Ionian mode, reckoning from the grave to the acute, was the second of the five middle modes in the Grecian system. This mode was also called *Jastian*, and Euclid still terms it the *grave Phrygian mode*. See *MODE*.

IONIS, in *Surgery*, a caubuncle of a violet colour.

JONKAKONDA, in *Geography*, a town of Africa, in the kingdom of Yari, on the N. side of the Gambia. N. lat. 13° 37'. W. long. 13° 50'.

JONKIOPING, a town of Sweden, in the province of Smaland, beautifully situated between two small lakes, at the southern extremity of the Wetter lake; it is the capital of the province, and the seat of the parliament or superior court of justice for the kingdom of Gothland. The town is two miles in circumference, and contains 3000 inhabitants; the houses are mostly of wood, covered with turf. This town contains two faubourgs, three churches, an arsenal, and a manufacture of arms; 156 miles S.W. of Stockholm. N. lat. 57° 45'. E. long. 13° 59'.

JONKS, or *JONQUES*, in *Ship Building*, vessels very common in the East Indies, about the bigness of our fly-boats, but differing in form of building, according to the various methods of the nations in those parts. See *JUNK*.

JONOOOL, in *Geography*, a town on the N.W. coast of the island of Timor. S. lat. 8° 59'. E. long. 125° 13'.

JONQUETIA, in *Botany*, was so called after Denis Jonquet, who, in the year 1665, published the *Hortus Regius Parisinus*, in folio. This catalogue contains about 4000 plants, of which indeed the greater part are only varieties; but amongst them are many Canadian and Alpine plants.—Schreb. 308. Willd. Sp. Pl. v. 2. 750. Mart. Mill. Dict. v. 2. (Tapirira; Aubl. Guian. v. 1. 470.—Tapiria, Juss. 372.) Class and order, *Decandria Pentagynia*. Nat. Ord. *Terebinthaceæ*, Juss.

Gen. Ch. Cal. Perianth of five, roundish, deciduous leaves. Cor. Petals five, roundish, concave, spreading, longer than the calyx. Stam. Filaments ten, shorter than the corolla, affixed to a gland; anthers roundish. Pist. Germen five-sided, surrounded by a glandule; styles none; stigmas five. Peric. Capsule somewhat globular, roundish, five-fruited, of one cell and five valves. Seeds five, ovate, arillated, each affixed to the valves.

Eff. Ch. Calyx of five leaves. Petals five. Capsule sub-globular, of one cell, five valves, and five arillated seeds.

1. *J. paniculata*. Willd. (J. guianensis; Mart.—Tapirira guianensis; Aubl. Guian. t. 188.)—A native of woods in Guiana, where it flowers in November, and brings forth fruit in April. It is there called Tapiriri.—This tree rises to the height of fifty feet, has a smooth russet bark, and a white uncompact wood. Leaves alternate, unequally pinnate; consisting of four or five pairs of smooth, thin, entire,

entire, oval, pointed leaflets. *Flowers* small, numerous, white, axillary, and terminating in large, wide, scattered panicles.

JONQUIL. See NARCISSUS.

JONSAC, in *Geography*, a town of France, and principal place of a district, in the department of the Lower Charente; nine miles S.S.E. of Pons. The place contains 2509, and the canton 11,941 inhabitants, on a territory of 187½ kilometres, in 20 communes.

JONSBERG, a town of Sweden, in East Gothland, near the coast of the Baltic; 22 miles E. of Nordkiöping.

JONSON, or JOHNSON, BENJAMIN, in *Biography*, an English poet, was born, in 1574, at Westminster, about a month after his father's death. He was educated at Westminster school under the learned Camden, and had made great progress in his studies, when his mother, who had married a bricklayer for a second husband, took him from school to work under his father-in-law. From this employment he escaped, enlisted for a common soldier, and served in the army, contending with the Spaniards in the Netherlands. On his return from a service in which he had gained much reputation, he entered himself at St. John's college, Cambridge; but the state of his finances obliged him soon to quit this residence. He next attempted the profession of an actor on the stage, but his talents were but ill adapted to this business; and from the life of an actor he undertook the more arduous task of dramatic writing. He was patronized by the immortal Shakspeare. The first piece which Jonson printed was "Every Man in his Humour," acted in 1598; his success in this effort led him to furnish a play yearly, till his time was occupied by the composition of the masques, &c. with which the accession of king James was celebrated. In 1609, he produced his "Epicene, or Silent Woman," which is accounted the most perfect of his comedies; and in the following year "The Alchemist" was performed with great applause. So industrious had his Muse been, that in 1616 he published a folio volume of his works, and in the same year he received a grant from the king of the salary of poet-laureat for life; the office being at that time occupied by another, but to the duties of which Jonson succeeded in 1619. He continued to write for the court and stage, but, in 1629, one of his comedies was hissed off the stage. From this time he fell into necessitous circumstances, owing as well to the negligence of his disposition, as to his fondness for convivial society. It has been asserted, that king Charles I. hearing of his distress, sent him ten pounds, a present very unsuitable to the means of a great monarch, and which the poet received with an ill grace: the fact has, however, been doubted, because in Jonson's works is to be found an epigram, "To king Charles for an hundred pounds he sent me in my sickness, 1629." From this period the powers of his mind and body seemed to droop together, and his later productions are but mendicant poems addressed to different patrons. He died in 1637, at the age of sixty-three. He was interred in Westminster Abbey, and the inscription "O rare Ben Jonson" was placed over his grave. This short sentence shews in what estimation his talents had been held. He had indeed been regarded as at the head of English poetry, and was addressed by the wits with the reverential title of "Father Ben." The bust that now marks his place in Westminster Abbey, was put up by the second earl of Oxford. The fame of Jonson is principally founded upon his comedies, which were for a long time reckoned the most perfect in the English language: but they have gradually disappeared from the stage. It is now generally admitted that his excellence was comprised within

narrow limits, and chiefly consisted in the preservation of the unities and the skilful management of the plot, but he was defective in almost every thing which makes comedy pleasant. "As a general poet, Jonson is for the most part harsh, frigid, and tedious, perpetually in pursuit of some uncommon thought, which he wants taste and genius to render striking and agreeable." Biog. Brit.

JONTHLASPI, in *Botany*. See CLYPEOLA.

JONTHOS, *Jonthos*, in *Medicine*, signifies small inflamed tumours, or pimples, which occur in the face. It was translated *varus* by the Latins, which term they also applied to the *acne* of the Greeks. The *ionthi*, or *vari*, according to Sauvages, "are those small, red, hard, and obstinate tumours, which scarcely ever suppurate, do not itch, are not painful, and only appear in the face." He considers them as of the same nature with the *Gutta rosea*.

JOOD-BOODANG, in *Geography*, a town on the W. coast of the island of Celebes. S. lat. 1° 39'. E. long. 119° 21'.

JOODPOUR, a circar of Hindoostan, being one of the three great principalities into which Rajpootana is divided. It was also named Marwar. In Acbar's division of the empire, these principalities were classed as belonging to the subah of Agimere, which is sometimes called Marwar. This principality lies to the N.W., bordering angularly on the other two, viz. Oudipour and Jyenagur. The revenues are stated to have been, in 1759, 40 lacks of rupees. This, as well as Oudipour, is very mountainous, with a sandy soil in the vallies. (See RAJPOOTANA.)—Also, a town in the above circar, in the country of Agimere; 85 miles W.S.W. of Agimere. N. lat. 26° 7'. E. long. 73° 48'.

JOOGDANPOUR, a town of Bengal; 16 miles N.W. of Kishenagur.

JOOGDYA, a town of Bengal; 70 miles S. E. of Dacca.

JOOKY, a town of Bengal; 14 miles N.E. of Bogli-pour.

JOOSTLAND, St., a small island of Holland, separated from the island of Walcheren, by a narrow channel, and containing one village.

JOOTSI-SIMA, or JAOTSIMA, two small islands of Japan, near the N. coast of Nippon. N. lat. 37° 56'. E. long. 137° 50'.

IOPEAN, among the ancients, an exclamation used on account of a victory, or some prosperous event. Hoffman thinks that *Io Pean* is a contraction of the Hebrew *Jao*, from *Jehovah*, and פנה, *respexit*; and was the same with *Jehovah Penoch*, i. e. *Dominus respiciat in nos*. Something like this exclamation still remains among the Symeones, a people of the West Indies, who, on any joyful occasion, frequently cry out *To Peko*.

JOPPA, in *Ancient Geography*, a town of Phœnicia, situated at the southern extremity of the plain of Saron, on a high hill, which commanded a full prospect of the sea on one side, and of a fertile country on the other. It had the town of Jamnia on the S.; Cæsarea Palestina on the N.; and Rama, or Ramula, on the E.; and it is often mentioned both in the Old and New Testament. The Greeks and Phœnicians ascribe to it a very high antiquity; and it is certain that it existed 500 years before the Christian era, since Joshua marks the limits of the tribe of Dan in the vicinity of Japho, the Phœnician name of this town. Joppa, which had a good port, and the only one that the Jews had on the Mediterranean, belonged successively to the Chaldeans, Persians, the Lagidæ of Egypt, and the Seleucidæ of Syria; and it was under the dominion of these last 163 years B. C. The inhabitants of this place provoked the

indignation of Judas Macchabæus, by a violation of their treaties, and by precipitating 200 Jews into the sea, which induced him to fall upon them by surprise in the night and to burn all their vessels. Joppa underwent various revolutions until the arrival of Pompey in Syria, about 64 years before our era. This general retracted Judea within its ancient bounds, and obliged Hyrcanus to evacuate the towns of Phœnicia; but Augustus gave this town to Herod. In consequence of the revolt of the Jews, Gallus-Cæsius, governor of Syria, took it and set it on fire, A.D. 66. The Jews made several efforts to re-establish it; but Vespasian, in the year 67, dispatched a body of troops from Cæsarea, who took it without difficulty. The Jews betook themselves for refuge to the sea; but being beset by a violent tempest, more than 4000 of them perished. The Romans again destroyed it. (Josephus de Bell. Jud.) The town was so entirely ruined during the holy war, that it had scarcely any buildings left standing but the old castle, situated on an eminence above it, and another near the sea-side. The town was afterwards rebuilt towards the sea with good store-houses; and is now called *Jaffa*, or *Tafa*, which see.

JOPPA, in *Geography*, a small town of America, in Harford county, Maryland; 20 miles E. by N. of Baltimore.

JORBORG, a town of Samogitia, on the Niemen; 20 miles S. of Rostenne.

JORDAENS, JACOB, in *Biography*, a painter of history and portraits, possessed of very superior abilities in his art, was born at Antwerp in 1594. He first studied with Adan Van Oort, whose daughter he married at an early period of his life; but it was to Rubens he stood indebted for the principal part of his knowledge; though it is dubious whether he ever was admitted into the school of that master. Certain it is, however, that he more forcibly carried into effect his principles than any of his disciples, except Vandyke.

It is said by Sandrart, that Rubens was jealous of him, and if so great a man were capable of that mean passion, certainly the talents of Jordaens might well excite it. He painted with almost incredible force and brilliancy. Neither Rubens nor Tintoretto, in that respect, excel him; his compositions are full of bustle, and designed with great truth, even grandeur of form. His defect (and it must be allowed that it is a great one, in an art whose principal end is to adorn, to improve, to please mankind) is grossness of subject and of form; not indecent, but vulgar, low common life.

His power to give rotundity and relief to his figures, is amazing; and his execution is of the most masterly kind.

The French have possessed themselves of many of his principal works; two are particularly noticeable in the gallery of the Louvre, the Flemish celebration of Twelfth night, known by the appellation of "Le Roi boit," and Christ driving the money-changers from the temple.

He was remarkable for the rapidity of his execution, and appears to have studied his figures and effects by candle light, or in bright sun-shine. Having obtained great renown and success, he died in 1678.

JORDAN, in *Ancient Geography*, the chief river of Palestine, which had its source in the lake of Phiala, about 10 miles N. of that of Samachon; which origin of the river was ascertained by Philip the tetrarch, who made the experiment of throwing some straw or chaff into the lake, which came out at the Panion, or Paneas, where the river emerges out of the earth, after having run about 120 furlongs under ground. This lake Phiala, a name commonly given to all other reservoirs of that kind, is situated in a most

delightful country, so well adapted for commerce, that marts and fairs are held in the adjacent places through the summer by the neighbouring inhabitants. The etymology of the name has been variously assigned. Jordan, in Hebrew *Jarden*, is derived from *jerad*, *descendit*, or *jarden*, *descensus*, from its rapid descent through that country. This origin is more probable than several others which have been given by different writers. Some say that it is formed of the oriental *Jor*, a stream, and *Dan*, a town, near which it had its source. Hardouin says that this name signifies the "river of delight," or the "delightful river." Others say, that *dan* or *dun* signifies depth, whence it was named the "deep river," to distinguish it from others in Palestine, all which were comparatively brooks or rivulets. The Arabs call it Arden or Harden, or Ordounon; the Persians, Aerdun; and the Nubian geographer Edrifi gives it the name of Zacehar, which, in Arabic, signifies swelling or overflowing. Jordan is so considerable, in comparison with others, that it is sometimes styled, by way of emphasis, "the river." The course of the Jordan is mostly southward, bending a few degrees towards the west. After a run of about ten or twelve miles, it passes quite through the Samachonite lake, whence, after a course of about eighteen or twenty miles more, exclusive of its windings, it enters into the sea of Tiberias on the N. side, and comes out again on the S. side, at a small distance from a city of that name. Thence it proceeds still south-westward through a plain and desert of about 60 miles, and falls into the Asphaltite lake. Its course is very rapid, though its bed is deep. Pococke compares its breadth to that of the Thames at Windsor. Shaw gives it only 30 yards, whilst he states its depth, even at its brink, to be three yards. Its banks are occasionally beautiful, and in some places covered with high and thick reeds, canes, and trees, such as willows and tamarisks, which afford a convenient lodgment for lions and other wild beasts. This river, it is said, constantly overflowed its banks about the time of the early harvest, or soon after Easter; and in this respect differed from other rivers, which commonly swell most during the winter. This inundation has been ascribed to its subterraneous communication with the Nile. But it is more probably owing to the melting of the snows about that time, and the early rain which falls in great abundance. Modern travellers inform us, that it is no longer subject to these overflowings: because, as they conceive, it has, by the rapidity of its current, worn its channel deeper than formerly, or, perhaps, diverted some of its waters another way. Its water is commonly very turbid, occasioned by its rapidity; but it is said to be very wholesome and incorruptible: and superstition has even invested it with the property of washing away the sins of mankind. Dr. Pococke, who mentions this circumstance, adds, that not only men, but women, are ambitious of deriving benefit from these salutiferous waters, by bathing and swimming in it, even at the hazard of their lives. The Latin priests erect altars along its banks, where they say mass to the devout pilgrims. We shall only add, that the plain on both sides of this river, from the sea of Tiberias to the Asphaltite or Dead sea, is very dry, sultry, and insalubrious during the heat of summer, and every where barren, except in that part which lies near the river, and is watered by it. *Anc. Un. Hist. vol. ii.*

JORDEN, EDWARD, M. D. in *Biography*, was born in the year 1569, at High Halden, in Kent, and probably educated at Hart-hall, Oxford. After completing his studies in his own country, he travelled abroad, visiting several foreign universities, and taking his degree of doctor in that of Padua. On his return, he practised for a time in London, where

where he became a member of the College of Physicians, and was in great reputation for learning and abilities. He gave an instance of his good sense in detecting the imposture of one Ann Gunter, who was affected with strange and singular symptoms, which were imputed to witchcraft. Dr. Jorden removed, after some time, from London to Bath, where he spent all the latter part of his life, universally respected as well in his private character as in his medical capacity. The studious and sedentary life which he led, aggravating the disorders to which he was constitutionally subject, the gout and stone, he died in his sixty-third year, on January 7th, 1632. He was author of two publications: "A brief Discourse of a Disease called the Suffocation of the Mother, &c." Lond. 1603; and 2. "A Discourse of Natural Baths and Mineral Waters;" Lond. 1631, 4to. This soon went through a second edition, and was afterwards reprinted in 1669, in 8vo., by Dr. Guidott, and again in 1673. It is a work of considerable learning and ingenuity, written in a clear style and judicious method. Aikin's Biog. Mem. of Med.

JORE, in *Geography*, the highest mountain in the Cherokee country, through which the Tennessee river forces its waters.

JORGA, a town of Asiatic Georgia, in the province of Kaketi; 85 miles S.E. of Teflis.

JORGE GREGO, a small island near the coast of Brasil.

JORGE, *St.*, a town of Brasil, in the government of St. Salvador, and chief place of the captaincy of Illicos, situated on land projecting into the Atlantic. S. lat. $14^{\circ} 45'$. W. long. $22^{\circ} 40'$.—Also, a town of New Mexico, on the Bravo; 20 miles E. of Sumas.

JORGE de Olancho, *St.*, a town of Mexico, in the province of Honduras; 100 miles E. of Valladolid. N. lat. $14^{\circ} 35'$. W. long. $86^{\circ} 36'$.

JORGEN, a town of Norway, in the diocese of Bergen; 33 miles S.W. of Romsdal.

JORGEN, *St.*, a town of the duchy of Stiria; 14 miles S.E. of Gratz.—Also, a town of Austria; 12 miles S.E. of Ips.—Also, a town of the duchy of Bremen; 8 miles N.N.E. of Bremen.

JORGENAW, a town of Prussia, in the circle of Natangen; 22 miles S.S.E. of Konigsberg.

JORGENBURG, a town of Austria; 14 miles S.S.W. of Steyr.

JORGENTAL, a town of Prussia, in the province of Oberland; 6 miles S.W. of Leibstadt.

JORGENTHAL, a town of Bohemia, in the circle of Leitmeritz; 6 miles N.E. of Kamnitz.

JORJAN, or CORCAN, a town of Persia, and capital of a district, to which it gives name, in the western part of Chorasán, bordering on the Caspian sea, situated on the Abiscoun. It was anciently the capital of Hyrcania, and named Syringes; 300 miles N. of Ispahan. N. lat. $36^{\circ} 54'$. E. long. $54^{\circ} 54'$.

JORKOW, a town of Bohemia, in the circle of Saatz; 13 miles N. of Saatz. N. lat. $50^{\circ} 28'$. E. long. $13^{\circ} 26'$.

JOROPOUR, a town of Bengal; 38 miles N.N.E. of Calcutta.

JORQUERA, a town of Spain, in New Castile, on the Xicar; 38 miles S.S.E. of Alarcon.

JORRACH, a town of Arabia, in the province of Hedjis; 188 miles S.S.E. of Mecca.

JORSA, one of the smaller western islands of Scotland, between Scarba and Kerrera.

JORTIN, JOHN, in *Biography*, born in London in 1698, was son of Renatus Jortin, a native of Bretagne, in France, who came over as a refugee on the repeal of the edict of Nantes,

and who was appointed one of the gentlemen of the privy-chamber to king William III. in 1691. He was afterwards secretary to admiral Russel, earl of Orford, and sir Cloudefley Shovel, and perished with the latter when his ship struck on the rocks of Scilly. This was in October 1707, when his son John, only nine years of age, was sent to the Charter-house as a day-scholar, where he laid the foundation of an exact and elegant classical taste. In 1715 he was admitted pensioner of Jesus college, Cambridge, and so distinguished himself by his talents and application, that, while he was under-graduate, he was engaged, by the recommendation of Dr. Thirlby, to translate some of Eustathius's notes on Homer for Mr. Pope. He performed the work to the satisfaction of the poet, who, however, did not think it worth while to make any personal enquiry after a young student at college. "I was," says Mr. Jortin, "in some hopes, in those days (for I was young), that Mr. Pope would make enquiry about his coadjutor, and take some civil notice of him. But he did not, and I had no notion of obtruding myself upon him—I never saw his face." Mr. Jortin was admitted to the degree of bachelor of arts in January 1718-19, and was elected fellow of Jesus college in October, 1721, and in the following year he took his degree of M. A. In this latter year he was appointed one of the moderators at the disputations, and appeared likewise as a writer, by the publication of his "Lusus Poetici," a collection of Latin poems, which have been ranked among the most elegant and truly classical compositions of the kind produced by a modern scholar. They have been frequently reprinted, and retain their original reputation. He was admitted to priest's orders in 1724, and in 1727 was presented by his college to the vicarage of Swavesey, near Cambridge. In 1730-1, he resigned his vicarage, and settled in London, where he served a chapel belonging to St. Giles in the Fields, in New-street, Bloomsbury, about sixteen years. His first publication, after his arrival in the metropolis, consisted of four sermons on the truth of Christianity, which have since been incorporated in some of his subsequent publications. In the years 1731 and 1732, Mr. Jortin, in conjunction with bishop Pearse, Dr. Taylor, Mr. Upton, Dr. Thirlby, and others, published, in a series of twenty-four six-penny numbers, "Miscellaneous Observations upon Authors, ancient and modern," which were highly applauded by the learned of his own country, and which were translated into the Latin language at Amsterdam. He next published "Remarks on Spenser's Poems," to which were subjoined "Remarks on Milton;" he published likewise "Remarks on Seneca." In 1747 he was appointed by his friend Dr. Pearse, then rector of St. Martin in the Fields, to be afternoon preacher at a chapel in Oxendon-street. In 1749, Mr. Jortin, at the recommendation of archbishop Herring and bishop Sherlock, was appointed preacher of Boyle's lecture. The substance of the discourses which he delivered on this occasion, was afterwards inserted in his "Remarks upon Ecclesiastical History." Of this work, the first volume was published in 1751, and the second and third in the years 1752 and 1754, the other volumes were given to the world after the author's death. In 1751, he had been presented by archbishop Herring with the rectory of St. Dunstan in the East; and in the year 1755, he was presented by the same prelate with a Lambeth degree of D. D. The principal work of Dr. Jortin was his "Life of Erasmus," of which the first part was published in 1758, in one volume 4to; the second volume, printed in 1760, consisted only of observations on the writings of Erasmus. The groundwork of this piece of biography, is one drawn up by the celebrated Le Clerc, and published in his "Bibliothèque Choisie."

Choirie." "The life of Erasmus," says Dr. Knox, "abound with matter interesting to the scholar; but the style and method are such as will not please every reader. There is a carelessness in it, and a want of dignity and delicacy." Nevertheless it extended the reputation of Dr. Jortin beyond the limits of his native country, and established his literary character in the remotest universities of Europe. The declining years of Dr. Jortin were cheered by some substantial proofs of the esteem which he had inspired for his character and abilities. In 1762, he was collated by bishop Osbaldiston to a prebend in the cathedral of St. Paul's, and in the same year he was presented by the same friend to the valuable vicarage of Kenfington. The bishop, as another proof of his determined patronage of our author, appointed him archdeacon of London, in April 1764, and it is believed he offered him the rectory of St. James, Westminster, upon the death of Dr. Samuel Nicolls, in November 1763, but he chose to continue at Kenfington, that being a situation better adapted to his advanced age. Dr. Jortin died on the 5th of Sept. 1770, in the 72d year of his age. The tranquil composure of his last moments was expressed in the words he spoke to his nurse, who urged him to take more nourishment: "No," said he, "I have had enough of every thing." He left a widow and two children. The private character of Dr. Jortin was truly estimable: he had a spirit which raised him above every thing mean and illiberal, and would not permit him to stoop for preferment. His manners were simple, and in some respects rustic: he had true urbanity in his temper, and benevolence in his heart. As a public defender of religion, he is classed by bishop Watson among those great and eminent names who have honourably and successfully laboured to establish the truth and illustrate the doctrines of Christianity. Dr. Knox, speaking of his "Discourses on the Christian Religion," which was one of the first fruits of his theological pursuits, says they abound with sound sense and solid argument, which entitled their author to a rank very near the celebrated Grotius. He farther adds, "as a poet, a philosopher, and a man, he served the cause of religion, learning, and morality." Besides the works already noticed, Dr. Jortin was author of an "Essay on Musical Expression;" of "Six Dissertations on different Subjects;" and after his death his "Sermons and Charges," in seven volumes, were given to the world. His works were published a few years since in an uniform manner, and may be had with or without the life of Erasmus. Of these works a full account will be found in the "Memoirs of the Life and Writings of Dr. Jortin," by the Rev. Dr. John Disney, who has also given the character of the author as drawn by the energetic pen of Dr. Parr. "Jortin," says he, "whether I look back to his verse, to his prose, to his critical, or to his theological works, there are few authors to whom I am so much indebted for rational entertainment, or for solid instruction. Learned he was, without pedantry. He was ingenious without the affectation of singularity. He was a lover of truth, without hovering over the gloomy abyss of scepticism, and a friend to free inquiry, without roving into the dreary and pathless wilds of latitudinarianism. He had a heart which never disgraced the powers of his understanding. With a lively imagination, an elegant taste, and a judgment most masculine, and most correct, he united the artless and amiable negligence of a school-boy. Wit without ill nature, and sense without effort, he could at will scatter upon every subject, and in every book the writer presents us with a near and distinct view of the real man."

JORVIS, in *Geography*, a town of Sweden, in the government of Kuopio; 43 miles S. of Kuopio.

IOS, in *Ancient Geography*, one of the Cyclades islands, E.N.E. of the island Sicinos, N.N.W. of Thera, and S.S.W. of Nayos. This island derived its name from a colony of Ionians, who were its first inhabitants. It is famous only for being the place of Homer's death and burial. It is said that the town of Argos was accustomed to send every five years a deputation to this island, commissioned to offer libations in its name on the tomb of the poet, which was an object of public veneration.

JOSEF, *St.*, in *Geography*, a town of California, where the Manila ship generally took in water on its voyage to Acapulco; 45 miles S. of Loreto. N. lat. 23° 4'. W. long. 109° 48'.—Also, a town of the island of Cuba; 125 miles W.S.W. of Havanna.—Also, a town of South America, in the province of Chiquitas.—Also, a town of South America, in the province of Moxes.—Also, a small island in the Atlantic, near the coast of Patagonia. S. lat. 44° 30'.—Also, a town of New Mexico, in the province of Sonora; 35 miles S. of Pitquin.—Also, a town of New Mexico, on the Bravo; 27 miles N.W. of Santa-Fé.—Also, a town of South America, in the government of Buenos Ayres; 185 miles E. of Corientes.—Also, a small island in the bay of Los Camarones, near the coast of Patagonia. S. lat. 44° 30'.—Also, a town and fort of South America, in the province of Tucumár; 90 miles S.S.E. of Salta.—Also, a town of South America, in the government of Buenos Ayres, and province of Moxes; 80 miles S.W. of Trinidad.

JOSEF de Chiquitas, *St.*, a town of South America, in the government of Buenos Ayres; 36 miles N.W. of Santa Cruz de la Sierra la Nueva.

JOSEF de Hualas, *St.*, a town of South America, in the audience of Quito, on the Napo; 220 miles E.S.E. of Quito. S. lat. 1° 50'. W. long. 74° 26'.

JOSEFGROD, a town of Russian Poland, in the palatinate of Bräclaw, situated on a river which runs into the Bog; 76 miles S.S.E. of Bräclaw.

JOSEPH, in *Scripture Biography*, a Hebrew patriarch, who sustained a rank and character that entitle him to particular notice. He was the son of Jacob by his wife Rachel, and born about the year 1745 B.C. As he was the favourite of his father, on account of his personal and mental endowments, he became the object of the jealousy and hatred of his brethren; and they sold him to some Ishmaelites who were travelling to Egypt (B.C. 1728), feigning a tale that he had been devoured by wild beasts. When the Ishmaelites arrived in Egypt, they sold Joseph to Potiphar, an officer of the royal household. In this situation Joseph conducted himself with such prudence, industry, and fidelity, that his master committed all his affairs to his management. After ten years service Potiphar's wife assailed him with a temptation, which every principle of gratitude and honour, as well as of religion, induced him to resist; but the consequence of his integrity was her resentment, and a resolution, as far as she could prevail, to effect his ruin. Accordingly she formed an artful story, intimating that Joseph had made an attempt upon her virtue; and she contrived to impose upon her husband Potiphar, and to procure Joseph's commitment to prison. The patriarch's conduct, during his imprisonment, engaged confidence, and he was entrusted with the care of his fellow-prisoners. Among these were two persons of some distinction, who had belonged to Pharaoh's household. Both of them had dreams in the same night, which they communicated to Joseph, and which he undertook to interpret. One of them was to be restored to his office, and the other was to be hanged; and the events corresponded to his predictions. Upon the future advancement of one of these persons, who was the chief butler, the other

other being the chief baker, he was altogether unmindful of Joseph, and made no effort, notwithstanding his application to him, to procure for him his liberty. In process of time Pharaoh had two dreams, by which his mind was much impressed, and which none of the wise men who belonged to his court were able to interpret. The chief butler was thus reminded of Joseph, and acknowledging to the king his ingratitude for neglecting him, related the circumstances pertaining to himself and the chief baker. Upon this information, Pharaoh ordered Joseph to be brought to him. The king imparted to him his dreams; and Joseph, modestly disclaiming all pretensions to superior wisdom, and relying on that divine suggestion with which he hoped to be favoured, interpreted them to his satisfaction. (B.C. 1715.) These dreams and their interpretation it is unnecessary for us minutely to recite. It is sufficient to observe, that the king was then forewarned of seven years of fertility and abundance, which were to be succeeded by the same period of sterility and famine; and he found it necessary to make previous provision accordingly. With this view Joseph, who was near thirty years of age, was appointed general superintendent of the affairs of the kingdom, and invested with authority next to that of Pharaoh himself, who also gave him in marriage the daughter of Potipherah, priest of On. The course of events was precisely such as Joseph had pre-signified by his interpretation of Pharaoh's dreams; so that granaries were established under his direction in the cities of Egypt, and corn collected in great quantities, and laid up in store, during the years of plenty, for the supply, not only of Egypt, but of neighbouring countries in the succeeding years of scarcity. The years of famine began B.C. 1708. In this period of general distress Jacob sent 10 of his sons, from Canaan to Egypt, in order to purchase corn. As this business was wholly committed to the management of Joseph, they were referred to him. Joseph instantly recognized their persons, though he was unknown to them; but in order the more effectually to prevent their discovery of him, and, probably, to excite in their minds a due sense of their past crime, he questioned them in an angry tone, and by an interpreter, concerning their country; and being informed that they had come from the land of Canaan, charged them with being spies, which charge they obviated by giving a true account of their father and family. A younger brother, they said, was left at home with his father, and another was now no more. Joseph still persisted in the charge, and required their verifying the account which they had given of themselves, by dispatching one of their number to fetch their younger brother, while the rest remained in custody. However, he afterwards relented, and proposed that one of them should remain till the arrival of the younger brother, and that all the rest should go home with corn for their families. During their detention they accused one another for the cruelty of their conduct towards Joseph, who, still feigning himself a stranger to their language, heard their mutual reproaches with an emotion which he could not suppress, and which, therefore, required his withdrawing from them. At length he gave them leave to depart, informing them, that if their account of themselves was true, they would be permitted to traffic in the land. Simeon, who is supposed to have been the principal aggressor in the treatment of Joseph, was kept in custody; and the others were dismissed. Before their departure orders had been given that when the sacks were filled with corn, each man's money should be returned in his sack's mouth. This circumstance, when it was discovered in their journey homewards, very much alarmed them; and they concluded

that this was done in order to furnish a pretence for enslaving them when they next visited Egypt. Jacob heard their adventures with surprise and concern; more especially when he found that Simeon was left behind in custody, and that they were pledged to take Benjamin with them before they could obtain his release. At length, as the scarcity increased, and their supply was nearly exhausted, Jacob, with great reluctance, consented to part with Benjamin; and having ordered them to provide presents for the ruler of Egypt, and to carry with them twice as much money as before, he committed them to the blessing of heaven, and dismissed them. Upon their arrival in Egypt, they hastened to present themselves before Joseph; and were kindly received and liberally entertained at a public dinner which he had provided for them. Some circumstances occurred on this occasion which might have brought their brother to their recollection; but they again departed with their sacks and money as before, and in Benjamin's sack was the silver cup out of which Joseph himself drank. Upon their return towards Canaan they were followed by an officer, who charged them with ingratitude for the hospitality with which they had been treated, and with the theft of his lord's silver cup. All of them protested their innocence; but upon searching the sacks, the cup was found to their great surprise and concern in that of Benjamin. They were therefore taken back to Joseph, who insisted upon detaining Benjamin as a slave, whilst they might be allowed to return home in peace. Recollecting the reluctance with which his father had parted with his son Benjamin, and that they were sureties for his return, they urged various pleas for his being allowed to accompany them. Judah was the advocate for his brother's liberty; and he offered himself as a substitute if he were permitted to return. Joseph was at length overcome; disguise became intolerably irksome to him; and he could no longer refrain from discovering himself to his brethren. (B.C. 1706.) This part of the sacred history is wrought up with incomparable beauty and pathos, and must suffer by any attempt to abridge it, or to relate it in different language. The discovery being made, they were all received, and particularly Benjamin, his brother by the same mother, with expressions of the tenderest and most affectionate regard; nor did Joseph, the viceroy of Egypt, for such was the high rank he occupied, lose any time in acquainting Pharaoh with the arrival of his brethren, and with the circumstances of his father and his family. The king immediately gave orders for their being sent for to Egypt, and for settling them in the richest part of the country. Goshen was the district which Joseph allotted to them; and there they were supplied with ample means of subsistence, whilst the inhabitants of other parts of Egypt were suffering great distress on account of the famine, which still continued. The long duration of this calamity drained the people of all their money, and constrained them at length to part with their cattle, their houses, their land, and even their personal freedom for support. (B.C. 1705.) Thus the whole kingdom of Egypt, the lands of the priests excepted, became the demesne of the crown; and all the people were reduced to the servile condition of bondsmen to the crown. Moreover, the old owners were separated from one another, and dispersed through different parts of the kingdom, that they might thus forget their interest in the lands which they had sold, and precluded from forming combinations for regaining them. In this instance, Joseph's zeal for Pharaoh's interest caused him to overstep the bounds which sound policy and justice prescribed; and contributed to establish a despotism, which eventually proved very oppressive to the descendants of Joseph, and the rest of the Israelites.

Israelites. In the last year of the famine, Joseph informed the Egyptians that they might expect a crop during the following year; and that he would enable them to renew their attention to agriculture, by distributing among them fresh lands, cattle, and corn: but he stipulated this condition with them, that from henceforward the fifth part of all the products of their lands should be reserved for the king, and that the residue should be their own. From this time, (B.C. 1702,) as the people consented to this regulation, it became a law, that remained in force for several centuries, that the fifth part of the produce of the whole kingdom of Egypt, the lands of the priests excepted, should belong to the crown. After the death of Jacob, and the return of his brethren to Egypt from Canaan, whither they had attended the remains of their father (see JACOB), they were apprehensive that Joseph might retaliate the injuries which they had done him; and therefore they informed him, by a messenger, that it was their father's dying request that he would forgive them, and continue to afford them his protection. Joseph immediately took an opportunity of removing their suspicion and anxiety, by repeated assurances of his unabated affection and zealous concern for their welfare. Having survived his father about 60 years, he informed his brethren (B.C. 1635), that God, according to his promise, would bring their posterity from Egypt to the land of Canaan; and he therefore made them pledge themselves on oath, to bury him with his ancestors. Joseph, having occupied under six sovereigns the office of viceroy of Egypt, during 80 years, retained it till his death, which happened when he had attained the age of 110 years, in the year 1635 B.C. When the Israelites took their departure from Egypt, they observed his injunction concerning the removal of his body; and as we read in Josh. xxiv. 32. it was buried at Schechem, in the field which Jacob bought of Hamor. From Jerome we learn, that the Israelites erected a noble monument to his memory, which was to be seen in his time. We shall not enlarge this article by an account of the tales of the Talmudists and of the Koran (chap. xii.), but refer the reader to D'Herbelot's *Bibl. Orient.* art. *Joufouph*, for specimens of these legendary tales. Gen. xxx.—I. *Anc. Un. Hist.* vol. iii.

JOSEPH I., in *Biography*, emperor of Germany, son of the emperor Leopold, was born in 1678. He was declared hereditary king of Hungary, and crowned in 1687. In 1690 he was elected king of the Romans, and ascended the imperial throne on the death of his father, in 1705. He pursued the system of the late emperor, and maintained the alliance against France, with England, Holland, and Savoy, in support of the claim of the archduke Charles to the crown of Spain; in which war the allies were successful. Joseph was of a haughty and arbitrary disposition, employed violent measures against all the opposers of his authority, and supported with a high hand all the claims of his house. In 1706 he put the electors of Bavaria and Cologne to the ban of the empire, for taking part with France; and having deprived those princes of a great part of their estates, he bestowed the same on his own relations and favourites. He quarrelled with the pope, whom he afterwards obliged to recognize his brother the archduke Charles as king of Spain. He made himself master of Italy, and levied contributions on Mantua, Parma, Modena, Lucca, Genoa, and other places. His armies defeated the revolted Hungarians; but in the midst of his successes, he was carried off by the small-pox, in April 1711, at the age of thirty-three, owing, it was believed, to the unskilfulness of his physicians. His character has been variously represented. He was impatient of opposition, active, and enterprising; and fre-

quently pursued from motives of resentment what he had first undertaken from policy. In his imperial capacity, he governed with more despotism than any of his predecessors; and the house of Bavaria was a monument of the inflexibility of his temper. *Univer. Hist.*

JOSEPH II., emperor of Germany, son of Francis of Lorraine and the empress-queen Maria Theresa, was born at Vienna, in March 1741. Great care was taken of his education; and at the age of nineteen, he was married to Isabella, the infanta of Parma. He had, at an early period, displayed a desire of distinguishing himself, and military glory was his first passion. He was crowned king of the Romans in 1764; and having lost his first wife, to whom he was tenderly attached, he married, in 1765, the sister of the elector of Bavaria. In this same year, on the death of his father Francis I., he succeeded to the imperial crown without opposition. He now displayed great talents and activity, by new-modelling the armies, and reforming all the departments of government. He travelled through his dominions, and visited Prussia, Italy, France, and Russia; and on his return, among many other wise and excellent regulations which he adopted, he set apart one day in every week for receiving petitions and complaints from all his subjects, without any distinction of birth or fortune; and the officers of his court were expressly forbidden to repulse any, even the meanest object, who came to implore his protection. "It behoves me," said the emperor, "to do justice; and it is my invariable intention to render it to all the world, without respect of persons." In the year 1771, Germany suffered the horrors of a famine, which was more or less felt in all the countries of Europe. But in several parts of Germany, the scarcity was so great, that vast numbers of people actually perished for the want of the commonest necessities of life. During these calamities, the emperor joined the monarchs of Prussia and Russia in the dismemberment of Poland. The first treaty for this iniquitous business was signed in 1772, and which finally terminated in the total extinction of that unhappy kingdom. In 1780, by the death of the empress-queen, Joseph succeeded to the crown of Hungary and Bohemia; and in the following year, he issued a decree in favour of the liberty of the press, which was followed by others equally liberal, particularly one in favour of a more liberal toleration. The suppression of the inquisition at Milan may be attributed to the prevalence of a similar spirit in the imperial councils. He extended the privileges of subjects to the Jews; and he shewed his attention to economy, by certain regulations relative to pensions, and by retrenching many which had been granted by the benevolent facility of his mother. He promulgated a decree in favour of the liberty of the press; and by one of the articles, he allowed a free circulation to literary reviews, and other periodical publications: he even permitted that all strictures upon the throne itself might be published with full security, provided they did not descend to the character of libels or pasquinades. "If," said he, "they be founded in justice, we shall profit by them; if not, we shall disregard them." In a journey to the Netherlands, the emperor gained the love of the people by his courtesy and generosity. He carried into effect a project for resuming that line of fortresses which was called the Dutch barrier, and was garrisoned by their forces. These were all dismantled, and the materials sold. On this visit he declared Ostend a free port, and ordered several improvements to be made in the harbour at his own expence. The emperor afterwards demanded of the Dutch the free navigation of the Scheldt; but in this he was unsuccessful. On his return to Vienna, he abolished the system of vassalage; and

and took the most decisive steps in ecclesiastical reform, and the reduction of the power of the church. Numerous suppressions of religious houses took place throughout all his dominions; and in an imperial rescript, all subordination whatever, in secular affairs, to the holy see was formally disclaimed. Such proceedings awakened the most lively alarms in the papal court; and on this occasion, pope Pius VI. made a journey to Vienna: but notwithstanding the very flattering attentions which he received on his arrival, he found it impossible to procure an intermission of those reforms, which were now extended to the secular clergy and hierarchy, as well as to the religious orders or regulars; and only obtained a respite for some threatened religious foundations. In 1786 the emperor followed his attack on the papal authority, by calling an assembly of the ecclesiastical princes at Ratisbon, in which it was resolved to withdraw from the jurisdiction of the pope. In 1788 a declaration of war was published against the Turks, and in the same year the emperor in person reduced Schabatz; but this was followed by the defeat of prince Linchenstein, who fell in the action. Soon after a bloody battle was fought between the Imperialists and the Turks, on the heights of Rohadin, in which neither party could claim the victory. The emperor now prepared to attempt the reduction of Belgrade; but notwithstanding the great preparations made on this occasion, his plans were defeated, and he had the mortification to witness the rapid destruction of his troops by a dreadful mortality. Putrid fever and dysenteries of the most malignant kind spread their influence through the imperial armies: discontent and complaint became universal; and in a short time, one of the finest armies in the world was reduced, in a single campaign, to less than half the number of its original combatants; the remainder being lost by mortality, desertion, and the sword, or rendered incapable of present service by disease. In the mean time, Joseph was labouring under the rapid decline of health, but still continued to employ himself indefatigably in public affairs. These, however, were mostly of a kind to aggravate, by vexation and anxiety, his bodily disorder. The Low Countries were again in a flame, and the most violent measures were taken to reduce the people to submission. Military execution took place in several cities, and a general gloom, bordering on despair, overspread the provinces. At length an open insurrection broke out, conducted with so much prudence and valour, that the imperial troops were repeatedly defeated: several important cities were taken possession of by the insurgents; and the states of Flanders, on November 20th, 1789, seized the government of the province, openly declaring that the emperor had forfeited all title to sovereignty. By the end of the year, Brussels had expelled its garrison; and a treaty of confederation was formed between all the Belgic provinces as independent states. Joseph, almost on his death-bed, was farther mortified by a remonstrance from the Hungarian nobility, demanding the restoration of their ancient rights and privileges. Willing to die in peace, he consented to all their requisitions, but insisted upon retaining three articles, which were highly creditable to his heart, *viz.* a general toleration, provision for the parochial clergy out of the revenues of some suppressed monasteries, and certain concessions in favour of the liberty of the peasants. He died with great composure, on the 20th of February 1790. Leaving no issue, he was succeeded by his brother Leopold. Joseph had many private virtues, as well as many of the qualities of a great and good sovereign. He was patient of fatigue, and possessed of an ardent mind. He applied himself with unremitting diligence to the suppression of intolerance and superstition, and the promotion of industry,

throughout his dominions. He has been accused of encroaching on the liberties of his Flemish subjects; and it will be readily conceded that he was not perfect: but his faults almost vanish among the truly glorious actions which contributed to the aggrandizement of his own name, and the permanent felicity of his people. Univer. Hist.

JOSEPH, king of Portugal, of the family of Braganza, was born in the year 1714, and succeeded his father in 1750. He was much beloved by his people, a circumstance that enabled him to effect several important regulations, in which his good sense and moderation were eminently conspicuous. Sensible of the danger of sudden changes, he advanced his designs by almost imperceptible steps, so as to prevent all just grounds of alarm and complaint. He subjected the powers of the infamous Inquisition to some restriction, by directing that none of its sentences should be carried into execution till reviewed and approved by the privy council. He carried into effect a treaty concluded between Spain and Portugal just before his father's death, which was considered as inimical to his country, on the principle "that all engagements among sovereigns should be held sacred and inviolable." This reign was marked, in 1755, with the terrible disaster of an earthquake, which destroyed a great part of the capital. A conspiracy in 1758, headed by the duke of Aveiro, and favoured by the Jesuits who had been banished from court, brought his life into great danger. The principal conspirators were seized and executed, and the whole order of Jesuits was banished the kingdom. Joseph had afterwards a dispute with the court of Rome, and a war with Spain: in the latter, Portugal was assisted by the English, whose battalions, under general Burgoyne, checked the career of the invaders, and obliged them, before the end of the campaign, to retreat within their own limits. After the peace of 1763, little of importance occurred in the affairs of Portugal. The king's councils, in the latter years of his reign, were entirely governed by the marquis de Pombal, a man of enlarged views, but of a haughty and violent disposition. A dispute with Spain, about the limits of the two nations on the borders of Rio de la Plata in South America, occasioned hostile preparations on both sides, but little was effected by either. Joseph died February 1777, and was succeeded by his daughter, Maria Frances Isabella, who is still queen, though in a deranged state of mind, and an exile in South America. See PORTUGAL.

JOSEPH of Exeter, or JOSEPHUS ISCANUS, is mentioned as a remarkable example of purity of literary taste and elegance of style, in an age generally reputed barbarous. He was a native of Devonshire, and flourished in the close of the twelfth, and the commencement of the thirteenth centuries. He was an ecclesiastic, and patronized by Baldwin, archbishop of Canterbury. According to the learned Camden, he accompanied Richard I. of England into the Holy Land. He was author of two epic poems in Latin heroics. The first, in six books, is on the Trojan war; the other is entitled "Antiocheis," the war of Antioch, or the Crusade; of this last only a fragment remains, in which the heroes of Britain are celebrated. The style of Joseph is not only, for the most part, pure, but rich and ornamented, and his versification approaches the best models of antiquity. His diction is compounded chiefly of Ovid, Statius, and Claudian, the favourite poets of the age. "Italy," says Mr. Warton, in his History of English Poetry, "had at that time produced no poet comparable to him." He was author of love verses, epigrams, and miscellaneous poems.

JOSEPH, *St.*, in *Geography*, a small island in the Indian sea. S. lat. 5° 45'. E. long. 54° 10'.—Also, a town of Africa, in the country of Galam, on the Senegal; 10 miles E.S.E.

of Galam.—Alfo, a town of Canada, on the right bank of the river St. Lawrence. N. lat. 46° 48'. W. long. 71° 8'. —Alfo, a town on the W. coast of the island of Dominica; 10 miles S. of Portfmouth.—Alfo, a town of Weft Florida, fituated in a bay of the gulf of Mexico, to which it gives name. N. lat. 29° 48'. W. long. 82° 34'. —Alfo, a town of California.—Alfo, an ifland in the ftraits of Marie, which convey the waters of lake Superior into lake Huron. —Alfo, a lake in North America, 31 miles long, and 15 broad, lying E. of lake Sal, and which fends its waters by Cat lake river into Cat lake, and afterwards forms the S.E. branch of Severn river. Osnaburgh houfe is on the N.E. part of the lake.—Alfo, a river which runs N.W. into the S.E. part of lake Michigan. The Pantewatamec Indians refide on this river, oppofite fort St. Jofeph. They can raife 200 warriors.—Alfo, a river in the ifland of Barbadoes, which runs into the fea; four miles N.W. of Consett's bay.—Alfo, a lake of Canada. N. lat. 50° 50'. W. long. 60° 25'.

ST. JOSEPH, *Fort*, called alfo *Gallam*, a town of Africa, fituated on the river Senegal, in N. lat. 14° 34'. W. long. 9° 21'.

JOSEPH di Oruna, *St.*, a town on the W. coast of the ifland of Trinidad. N. lat. 10° 25'. W. long. 60° 55'.

JOSEPH le Precheur, *St.*, a town of the ifland of Martinico.

JOSEPHINIA, in *Botany*, fo named by Ventenat, in honour of his munificent patroness Jofephine, the now divorced empress of Buonaparte, whose claim to fuch commemoration we have already admitted; fee HUMEA. Venten. Malmais. 67. Brown. Prodr. Nov. Holl. v. 1. 519. Clafs and order, *Didymia Angiospermia*. Nat. Ord. *Lurida*, Linn. *Bignonia*, Juss. *Pedaliina*, Brown.

Gen. Ch. *Cal.* Perianth inferior, in five deep, nearly equal, acute segments. *Cor.* of one petal, ringent; tube not much longer than the calyx; throat dilated, bell-shaped; limb five-lobed, fpreading, two-lipped, the upper lip in two equal rounded segments, lower in three, of which the middle one is largelt. *Stam.* Filaments four, awl-shaped, fhorter than the corolla, two of them fhorter than the reft, with the rudiment of a fifth; anthers heart-shaped, of two cells. *Pist.* Germen fuperior, pyramidal, rugofe; ftyle cylindrical, about equal to the ftamens; ftigma in four equal, oblong, acute segments. *Peric.* Nut angular, muricated, of from four to eight cells. *Seeds* folitary, erect, oblong.

Eff. Ch. Calyx in five deep segments. Corolla ringent; throat bell-shaped; limb five-lobed, the middle fegment of the lower lip longelt. Stigma four-cleft. Nut of feveral cells, muricated. Seeds folitary, erect.

1. *J. Imperatricis*. Vent. Malmais. t. 67.—Germen of about four cells. Leaves lanceolate; elliptical, acute, downy beneath like the ftem. Segments of the calyx equal. *Brown.*—Gathered by the French voyagers on the weft fide of New Holland, who brought feeds to the garden of La Malmaifon, where they fucceeded well. The plant is biennial, flowering in the middle of fummer, decumbent, of an inelegant or lurid afpect, with large, toothed, dull-green leaves. *Flowers* axillary, folitary, about an inch long, whitifh, variegated and fotted with dull purple.

2. *J. grandiflora*. Brown. Prodr. v. 1. 520.—Germen of eight cells. Leaves lanceolate, pointed, flightly downy beneath. Stem fmooth. Upper fegment of the calyx half the length of the reft. Lowelt fegment of the corolla more than twice as long as the others. *Brown.*—Gathered by Mr. Brown in the tropical part of New Holland.

JOSEPHSTHAL, in *Geography*, a town of Bohemia, in the circle of Boheftau; 12 miles N.N.E. of Turnau.

JOSEPHUS, FLAVIUS, in *Biography*, an eminent Jewifh hiftorian, was born in the year 37, when Caligula was emperor. His father was Mattathias, defcended from the ancient high-priefts of the Jews: by his mother he was of the royal lineage of the Afmonzeans, who, for a confiderable time, had the fupreme government of the Jewifh nation. He was educated together with his brother Matthias, and made fuch proficiency in knowledge, that when he was but fourteen years of age, the high-priefts, and fome of the principal people of the city, came frequently to confult him about the right interpretation of things in the law. In his fixteenth year he retired into the wildernefs, where he lived in great abftemiousnefs, and habits of felf-denial during the fpace of three years. He ftudied the principles of the leading fefts, and embraced, as the rule of his life and conduct, thofe of the Pharifees, and being now nineteen years of age, he began to act in public. At the age of twenty-fix he went to Rome, where, by means of a ftage-player of his own nation, he obtained an introduction to Poppæa, the emperor Nero's wife, by whose intereft he procured the releafe of fome priefts, whom Felix had fent prifoners from Jerufalem. Returning home, he was appointed by the revolted Jews governor of the two Galilees, in which capacity, as a general, he bravely defended Jotapata againft Vefpafian, but which was taken after a fiege of forty-feven days. When the city was in the hands of the conqueror, he gave orders to fearch for Jofephus, who had efaped the general mafacre, by concealing himfelf in a cavern cut in a rock. In this gloomy recess he met with forty men of eminence who had concealed themfelves, and had with them provifions fufficient for their fupport feveral days. Upon being difcovered, he propofed to the forty men who had taken refuge there with him, that they fhould all furrender, and upon their determination rather to perifh by mutual wounds, he perfuaded them to caft lots fucceffively, who fhould kill the next man, and by an extraordinary circumftance he and one other were left the furvivors of the reft. This fingle companion was eafily prevailed upon to join him in accepting the proffered mercy of the Romans. On being taken before Vefpafian, he boldly predicted that within a fhort time the empire would fall to the fhare of that general, by which prediction, which was afterwards fulfilled, he fecured a favourable reception from him; though he was retained as a prifoner on account of the ufe which Vefpafian intended to make of him in the farther profecution of the war againft the Jews. It fhould feem that Jofephus flattered himfelf with the notion that he was infpired with a knowledge of future events. "It is likely," fays the judicious and learned Lardner, "that he often thought of Jofeph in Egypt, and of Daniel in Babylon, and was in hopes of making a like figure at the court of Rome. But I fuppofe it may be no difparagement to Jofephus to fay, that he was not equal to them in wifdom, or in virtue and integrity." As foon as Vefpafian was feated on the imperial throne, Jofephus was fet at liberty, and was taken by Titus with him when he marched to lay fiege to Jerufalem. Here he faw the ruin of his country, of which he afterwards became the hiftorian. He was fent into the city with offers of peace upon condition of the fubmiffion of his countrymen. They defpifed his offers, and rejected his counfels with fcorn. The Jews now confidered him as a defertor and traitor to their caufe, and it is a fact that they never manifefted any great refpect for his writings. During the progrefs of the fiege he did not ceafe exhorting them to avoid their inevitable fate by a timely furrender, and once, approaching too near the walls, he received a wound which laid him fenfelefs on the ground. At the capture of the city, Jofephus obtained the libera-

tion

tion of Matthias and several friends without ransom; he had permission also to save what he pleased out of the ruins; but he contented himself with a copy of the sacred writings. The emperor heaped upon him his favours, and as a mark of his gratitude, he assumed their family surname of Flavius. He employed his leisure in drawing up those works which have immortalized his name. These are, 1. "The History of the Jewish war, and the taking of Jerusalem," in seven books. It was written in the language of his own country, and he afterwards published it in Greek for the benefit of other nations. He professes to have written with great fidelity, and appeals, for the truth of his history, to living witnesses. He presented the work to Vespasian and Titus, of whom the latter ordered it to be published, and signed it with his own hand to shew that it was authentic. 2. "The Jewish Antiquities" in twenty-four books, or the history of the Jews from the creation to the 12th year of Nero, in which the war began. To this is subjoined his life, written by himself, and dedicated to Epaphroditus, of whom we know nothing but from Josephus himself, who describes him as a lover of all kinds of learning, but as principally delighted with the knowledge of history, and this on account of his having been himself concerned in great affairs, and many turns of fortune, and having shewn a wonderful vigour of an excellent nature, and an immoveable virtuous resolution in them all. 3. He wrote also "Two books against Apion of Alexandria," which is a vindication of the Jewish people against the calumnies of that Egyptian author. "A Discourse on the Martyrdom of the Maccabees" is sometimes ascribed to him, but its genuineness is disputed, and Mr. Whitton who translated the other works would not give this a place in his volumes. The works of Josephus, though slighted by the Jews, are held in high estimation by Christians; his style is pure, agreeable, and sometimes eloquent; he has been called the Greek Livy; and, like that Roman writer, he is fond of displaying the powers of his own imagination by long speeches. The history of the Jewish war, of which he was a spectator, is a most interesting narrative. The best editions of the works of Josephus, are those of Hudson in two vols. folio. Oxford, 1720, and of Havercamp, in two vols. Amsterdam 1726. There have been a multitude of English translations; to that of Whitton we have already referred. Univer. Hist. Lardner, vols. i. and vii. edit. 1788. And Josephus's own Life.

JOSHUA, a canonical book of the Old Testament, containing a history of the wars and transactions of the person whose name it bears, who succeeded Moses in the government of the Israelites, in the year 1451 B.C. at the age of 90 years, and was their conductor to the land of Canaan. He was the son of Nun, of the tribe of Ephraim, and born in the land of Goshen, in the year 1536 B.C. At the period of the *Exodus* (which see), Joshua was distinguished by his talents and virtues, so that he was taken into the confidence of Moses, and selected to command the Israelites, when they were attacked by the Amalekites, in their march from mount Horeb to mount Sinai. He was likewise honoured with the privilege of accompanying Moses to mount Sinai, and of remaining with him forty days, when he received directions for the future government of the Israelites, and the laws written on the first tables of stone. He also accompanied Caleb, and other ten persons who were deputed to examine the land of Canaan, previous to the invasion of it by the Israelites. When Moses was apprized of his approaching dissolution, he confirmed Joshua as his successor in the most public and solemn manner. Although he was advanced in years when he conducted the Israelites to Canaan, he performed this arduous undertaking with singular prudence and

valour. When they were passing the river of Jordan, in the extraordinary manner which is recorded in their history, he directed two monuments to be erected as a memorial of their miraculous passage, one on the spot where the ark had stood in the bed of the river, and the other on the shore; and from the banks of Jordan he proceeded towards the plains of Jericho, and pitched his tent for the first time in Canaan, the land of which he was taking possession at Gilgal. For the conflicts and successes that attended his future progress, we refer to his history. Having surveyed and divided the lands among the several tribes (B.C. 1445), he governed Israel in peace; and when he became sensible that the termination of his life could be at no great distance, he summoned all the tribes of Israel to Shechem, and recited the extraordinary operations of the providence of God in their favour, and having awakened in their minds a becoming sense of gratitude, enforced upon them the wisdom and duty of persevering obedience to his laws, and exhorted them to renew the covenants by which they had already engaged to worship and serve him. This transaction was then solemnly registered, and a monument for perpetuating it was erected near a great oak which was in Shechem. Soon after this event, viz. in the year B.C. 1426, Joshua, having exhibited ample evidence of the propriety of his name, which denoted "Saviour," died in his retirement at Timnath-hera, at the age of 110 years. The book of Joshua, supposed to have been written by himself, and to have received some additions from Samuel and Ezra, (see *BIBLE* and *CANON*,) may be divided into three parts; the first of which is a history of the conquest of the land of Canaan; the second, which begins at the twelfth chapter, is a description of that country, and the division of it among the tribes; and the third, comprised in the two last chapters, contains the renewal of the covenant he caused the Israelites to make, and the death of their victorious leader and governor. The whole comprehends a term of seventeen, or, according to others, of twenty-seven years.

JOSIAH, king of Judah, deserves particular mention on account of his wisdom and piety, and some memorable events that occurred in the course of his reign. He succeeded to the throne, upon the assassination of his father Amon, at the age of eight years, in the year B.C. 640, and at a period when idolatry and wickedness, encouraged by his father's profligate example, very generally prevailed. Josiah, who manifested the influence of pious and virtuous principles at a very early age, began in his sixteenth year to project the reformation of the kingdom, and to adopt means for restoring the worship of the true God. At the age of twenty years he vigorously pursued the execution of the plans which he had meditated. He began with abolishing idolatry, first at Jerusalem, and then through different parts of the kingdom; destroying the altars which had been erected, and the idols which had been the objects of veneration and worship. He then proceeded, in his twenty-sixth year, to a complete restoration of the worship of God, and the regular service of the temple. Whilst he was prosecuting this pious work, and repairing the temple which had been long neglected, and which had sunk into a state of dilapidation, the book of the law, which had been concealed in the temple, was happily discovered. This was probably a copy of the Pentateuch, which had been lodged there for security by some pious priest in the reign of Ahaz or Manasseh. Josiah, desirous of averting from himself and the kingdom threatened judgments, determined to adhere to the directions of the law, in the business of reformation which he had undertaken, and to observe the festivals enjoined by Moses, which had been shamefully neglected. With this view he assembled all the elders of the people in the temple at Jerusalem, and

having ascended the throne, read the book of the Mosaic law, and then entered into a solemn covenant to observe the statutes and ordinances which it enjoined. To this covenant the whole assembly testified their consent. The ark was restored to its proper place; the temple was purified; idolatrous utensils were removed; and those appropriate to the worship of God substituted in their room. After these preparations, the passover was observed with singular zeal and magnificence. This took place in the eighteenth year of Josiah's reign. But in pursuing his laudable plans of reformation, he was resisted by the inveterate habits of the Israelites, so that his zealous and persevering efforts were ineffectual. Their degeneracy was so invincible, that the Almighty sovereign was provoked to inflict upon them those calamities which were denounced by the prophet Zephaniah. In the thirty-second year of Josiah's reign, Pharaoh Necho, king of Egypt, advanced with his army against Carchemish, a city situated on the river Euphrates; and he was opposed by the king of Judah; so that a bloody battle ensued at Megiddo, in which Josiah received a mortal wound, which terminated in his death, after he had been conveyed to Jerusalem, in the thirty-ninth year of his reign, B.C. 609. His death was greatly lamented by all his subjects; and an elegy was written on the occasion by the prophet Jeremiah, which is not now extant. 2 Kings, xxii. xxiii. 2 Chron. xxxiv. xxxv.

JOSIDA, in *Geography*, a town of Japan, in the island of Nippon; 16 miles E. of Seda.

JOSLOWITZ, a town of Moravia, in the circle of Znaim; 8 miles S.E. of Znaim.

JOSNIOW, a town of Poland, in Podolia; 48 miles N.N.W. of Kaminiac.

JOSQUIN DES PREZ, or, as he is called in Latin, *Josquinus*, or *Jodocus Pratenfis*, and in Italian *Giosquino del Prato*, in *Biography*, a Netherlander, the disciple of Okenheim, and maestro di cappella to Louis XII. king of France, was the greatest musician of his time; and, in many particulars, of any time, since the invention of counterpoint.

His compositions for the church, though long laid aside, and become obsolete by the gradual changes in notation, continue still to merit the attention of the curious. Indeed the laws and difficulties of canon, fugue, augmentation, diminution, reversion, and almost every other species of learned contrivance allowable in ecclesiastical compositions for voices, were never so well observed, or happily vanquished, as by Josquin; who may justly be called the father of modern harmony, and the inventor of almost every ingenious texture of its constituent parts, near a hundred years before the time of Palestrina, Orlando di Lasso, Tallis, or Bird, the great musical luminaries of the sixteenth century, whose names and works are still held in the highest reverence, by all true judges and lovers of what appears to us the true and genuine style of choral compositions.

This ingenious, learned, and voluminous composer, is enumerated, by Lewis Guicciardini, among Flemish musicians. However, the constant addition of Pratenfis, or Del Prato, to his name, seems rather to make him a native of Prato, in Tuscany; and the frequent mention that is made of him by Italian writers, implies at least, if he was not a native of Italy, that he had lived there, and that his works were very familiar to them; for not only by the name of Josquino, Jodoco del Prato, is he often mentioned by Franchinus, and all the musical writers of Italy in the next age, as a most excellent composer, but by miscellaneous writers, who only speak of music incidentally. As a proof of this, we need give no better authority than the following passage in Castiglione's admirable "Cortegiano."

This author, speaking of the operations of prejudice in favour of great names, tells us of the eagerness and delight with which a polite company of his acquaintance had read a copy of verses, supposing them to have been written by Sanazaro, who afterwards, when it was certain that they were not of his composition, thought them execrable. "So likewise," says one of the interlocutors, "a motet sung before the dukes of Urbino was unnoticed, till it was known to be the production of Josquin."

Franchinus, enumerating the great musicians of his time, specifies Tinctor, Gulielmus, Guarnerius, Josquin de Pret, Gaspar, Agricola, Loyset, Obrecht, Brumel, Isaac, and calls them *most delightful composers*.

The same author, in another work, lets us know that he had been personally acquainted with Josquin: for, speaking of some inaccuracies in the sesquialterate proportion, he says: "Di questi inconvenienti ne advertite gia molti anni passati Josquin Despret et Gaspar dignissimi Compositori." This was printed in 1508, so that "many years ago," must throw these composers far back into the fifteenth century; and, he adds, "though they acquiesced in my opinions, yet, having been corrupted by *long habit*, they were unable to adopt them."

Zarlino, who likewise speaks of him among the *pratici periti*, gives another instance of predilection in favour of Josquin at Rome, "which," says he, "was at the expence of my friend, the admirable Adrian Willaert, who has often himself confirmed the fact." The motet "verbum bonum et suave," for six voices, having been long performed in the pontifical chapel at Rome, on the festival of our Lady, as the production of Josquin, was thought to be one of the finest compositions of the time; but Willaert, having quitted Flanders, in order to visit Rome, in the time of Leo X. and finding that this motet was sung as the composition of Josquin, whose name was affixed to it in the chapel books, ventured to declare it to be his own work, and not that of the famous Josquin: but so great was the ignorance, envy, and prejudice of the singers, that, after this declaration, the motet was never again performed in the pontifical chapel.

Adami, in his historical list of the singers in the pope's chapel, mentions Josquin next to Guido, as one of the great cultivators and supporters of church music; he calls him "Uomo insigne per l'inventionc," and says that he was a singer in the pontifical chapel during the time of Sixtus IV.

After quitting Italy, he was appointed maestro di cappella to Lewis XII. of France, who reigned from 1468 to 1515, and it is hardly probable that such an honour should have been conferred upon him till he had arrived at great eminence in his profession; he must either have acquired the public favour by his works or performance, before he could be noticed by a sovereign; indeed the impediments to their approximation must have been reciprocal, and it has been well observed, that it is as difficult for a prince to get at a man of merit, as it is for a man of merit to approach a prince.

It is related, that when Josquin was first admitted into the service of Lewis, he had been promised a *benefice* by his majesty; but this prince, contrary to his usual custom, for he was in general both just and liberal, forgot the promise he had made to his maestro di cappella; when Josquin, after suffering great inconvenience from the shortness of his majesty's memory, ventured, by a singular expedient, to remind him publicly of his promise, without giving offence; for being commanded to compose a motet for the chapel royal, he chose part of the 119th Psalm: "Memor esto verbi tui servo tuo;" "Oh think of thy servant, as concerning thy word;" which he set in so suppleating and exquisite a manner, that it was universally admired, particularly by the king,

king, who was not only charmed with the music, but felt the force of the words so effectually, that he soon after granted his petition, by conferring on him the promised preferment: for which act of justice and munificence, Josquin, with equal felicity, composed, as a hymn of gratitude, another part of the same Psalm: "Bonitatem fecisti cum servo tuo, Domine," "Oh Lord, thou hast dealt graciously with thy servant."

Josquin seems to have been possessed of a certain vein of wit and humour, as well as musical genius; of which Glareanus has given his readers several instances, besides those just related. In consequence of the long procrastination of the performance of Lewis XIIth's promise relative to the benefice, Josquin applied to a nobleman, in high favour at court, to use his interest with this prince in his behalf, who, encouraging his hopes with protestations of zeal for his service, constantly ended with saying, "I shall take care of this business, *let me alone*!"—*Laisse faire moi (laisser moi faire)*, when, at length, Josquin, tired of this vain and fruitless assurance, turned it into solmisation, and composed an entire mass on these syllables of the hexachords *La sol fa re mi*; which mass is among the productions of our author in the British Museum, and is an admirable composition.

The following circumstance, which likewise happened during Josquin's residence at the court of France, has been recorded both by Glareanus and Merfennus. These writers inform us, that Lewis, though music afforded him great pleasure, had so weak and inflexible a voice, that he never was able to sing a tune, and that he desired his maestro di cappella to compose a piece of music in which it was possible for him to bear a part. However the musician accepted the challenge, and composed a canon for two voices, to which he added two other parts, one of which had nothing more to do than to sustain a single sound, and the other only the key note, and its fifth, to be sung alternately. Josquin gave his majesty the choice of these two parts, and beginning with the long note, after some time, his royal scholar was enabled to continue it, as a drone to the canon, in despite of nature, which had never intended him for a singer.

Rabelais, in his prologue to the third book of Pantagruel, places Josquin des Prez at the head of all the fifty-nine *Joyeux Musiciens* whom he had formerly heard. Josquin, among musicians, was the giant of his time, and seems to have arrived at universal monarchy and dominion over the affections and passions of the musical part of mankind. Indeed his compositions seem to have been as well known and as much practised throughout Europe, at the beginning of the 16th century, as Handel's were in England sixty years ago.

In the music book of prince Henry, afterwards Henry VIII., which is preserved in the Pepys' collection, at Cambridge, there are several of his compositions, and we are told that Anne of Boleyn, during her residence in France, had collected and learned a great number of them. In a very beautiful MS. in the British Museum, consisting of French songs of the 15th century, in three and four parts, there are likewise many of Josquin's compositions. But the most capital collection of his works, and of contemporary contrapuntists which we believe is now subsisting, is in the British Museum, consisting of the first and third set of the masses of Josquin, composed for the pope's chapel, during the pontificate of Sixtus IV., who reigned from 1471 to 1484; with masses by Pierre de la Rue, Ant. Fevin, John Moreton, &c.

All these were printed by Ottavio Petruccio da Fossombrone, under a patent from Leo X. signed by cardinal Bembo, his secretary. These masses were the first musical productions that issued from the press after the invention of

printing. And these very curious compositions must have been studied, and frequently rehearsed, before their performance; for though no rapidity of execution is required, yet, as there are no bars, and the value of the notes is frequently changed by position, as well as by the modal signs, upon very short notice, this, joined to the difficult solution of the canons, must have made it impossible for them to have been sung at sight, even by those who were accustomed to the notation.

Specimens of these compositions in score may be seen in Burney's History of Music, vol. ii., and whoever examines them will find that no notes have had admission by chance, or for the sake of *remplissage*, but that, like the prints of Hogarth, every thing not only contributes to the principal design and harmony of the whole, but has a specific character of its own.

But Josquin's masses, though more frequently cited and celebrated by musical writers than those of any other author, and indeed than any of his other works, seem inferior to his motets in every respect; for these are not only composed on subjects of his own invention, or in fragments of the most beautiful and solemn chants of the church, but in a style more clear and pleasing.

In the third and fourth collection of motets published at the beginning of the sixteenth century, under the title of "Motteti della Corona," there are many by Josquin, which are truly admirable, particularly a *miserere* for five voices, which, as it consists of three movements, is too long to be inserted in a work of this kind, but appears to us a model of choral composition, without instruments; as the subjects of fugue and imitation are simple, and free from secular levity; the style is grave and reverential; the harmony pure; the imitations are ingenious, and all constructed upon a fragment of canto fermo, to which the second tenor is wholly confined: repeating it, in the first part, a note lower every time, beginning at the fifth of the key, and descending to its octave; in the second part, ascending in the same manner; in the third part, beginning at the fifth, and descending to the key note.

This species of laboured composition has been frequently censured, and stigmatized by the name of pedantry, and Gothic barbarism, which, perhaps, it would now deserve, out of the church; but in the time of Josquin, when there was little melody, and no grace in the arrangement, or measure of single notes; the science of harmony, or ingenuity of contrivance in the combination of simultaneous sounds, or music in parts, as it was the chief employment of the student, and ambition of the composer, so the merit of both, and the degree of regard bestowed upon them by posterity, should be proportioned to their success, in what was their chief object, and not in what had no existence at the time in which these musicians lived.

With respect to some of Josquin's contrivances, such as augmentations, diminutions, and inverses of the melody, expressed by the barbarous Latin verb *canerizare*, from the retrograde motion of the *crab*, they were certainly pursued to an excess; but to subdue difficulties has ever been esteemed a merit of a certain kind, in all the arts, and treated with respect by artists. Michael Angelo, in delineating the difficult attitudes into which he chose to throw many figures in his works, and which other artists had not courage, or perhaps abilities to attempt, procured himself a great name among the judges of correct drawing, and bold design; though a great part of the spectator's pleasure in viewing them must arise from reflecting on the difficulty of the undertaking. There are different roads to the temple of fame in every art; and that which was followed by Josquin, and his

emulators, was too full of thorns, brambles, and impediments, to be pursued by men of common genius and abilities. Painting and sculpture, which are to delight and deceive the eye, do not, any more than music, confine their powers to the mere endeavour at pleasing the sense of which they are the object; and there are pictures, statues, and musical compositions, which afford very little pleasure but what is intellectual, and arising from reflection on the learning, correctness, and great labour which the artist must have bestowed on them.

Canons of difficult solution were, to musiciens, a species of problem, and served more to exercise the mind than please the sense; and though a peculiar genius, or penetration, is requisite for the quick discovery of riddles and rebusses, yet, still more cunning is necessary to their production; and, however contemptuously these harmonical contrivances may be treated by the lazy lovers of more airy and simple compositions, the study of them is still of such use to musical students, in their private exercises, that a profound and good contrapuntist has, perhaps, never yet been made by other means. Those who despise this seeming Gothic pedantry too much, resemble such half-bred scholars, as have expected to arrive at a consummate knowledge of the Roman classics, without submitting to the drudgery of grammar and syntax. Indeed a great composer has, perhaps, never existed since the invention of counterpoint, who, at his moments of leisure, has not attempted to manifest superior learning and skill in the production of canons, and other difficult arrangements and combinations of sound; and who, if he succeeded, was not vain of his abilities. Before the cultivation of dramatic music, as canon and fugue were universally studied and revered, they were brought to such a degree of perfection, as is wonderful; and though good taste has long banished them from the theatre, yet the church and chamber still, occasionally, retain them, with great propriety: in the church they preclude levity, and in the chamber exercise ingenuity.

As Euclid ranks first among ancient geometricians, so Josquin, for the number, difficulty, and excellence of his musical canons, seems entitled to the first place among the old composers, who have been most assiduous and successful in the cultivation of this difficult species of musical calculation.

But though the style of Josquin, even in his secular compositions, is grave, and chiefly in fugue, imitation, and other contrivances, with little air or melody; yet this defect is amply supplied to contrapuntists, and lovers of choral music, by purity of harmony and ingenuity of design. Indeed, we have never seen, among all his productions that we have scored, a single movement which is not stamped with some mark of the great master. And though fugue and canon were so universally cultivated in his time, when there were many men of abilities in this elaborate and complicated kind of writing; there is such a manifest superiority in his powers, such a simple majesty in his ideas, and such dignity of design, as wholly justify the homage which he received.

It will, perhaps, be thought that too much notice has been taken of this old composer and his works; but as he is one of the great heroes of the art, and the type of all musical excellence at the time in which he flourished, the less need be said of his contemporaries, who, in general, were but his imitators.

Josquin, according to Walther (*Musikalisches Lexicon*), was buried in the church of St. Gédule, at Brussels, where his figure and epitaph are still to be seen. His death must have happened early in the 16th century.

JOSS, or JOOSTJE, in *Mythology*, an idol worshipped by the Chinese at some of their grand festivals, which they observe by way of intercession for the sick at Batavia and elsewhere. To this idol they offer costly presents; and they also make a large vessel of paper and combustible materials, adorning it with flags, and then setting it on fire till it is consumed. The name Joolje, given to this idol by the Dutch, which the English seamen call Joss, is a Dutch nick-name for the devil, and was probably given to this idol by the Dutch, when they first saw it, either from its appearance, or from the principle that all idolatry is demonolatry.

JOSSÉLIN, in *Geography*, a town of France, in the department of Morbihan, and chief place of a canton, in the district of Ploermel; 19 miles N.N.E. of Vannes. The place contains 2678, and the canton 14,157 inhabitants, on a territory of 215 kilometres, in 10 communes. N. lat. 47° 57'. W. long. 2° 28'.

JOSSLIOKA, a town of Poland, in the palatinate of Sandomirz; 76 miles S.S.W. of Sandomirz.

JOSVO, a town of Hungary; 16 miles W. of Caschau.

JOTAKO, a small island in the Mediterranean; 2 miles E. of Teaki.

JOTAN, a town of Asiatic Turkey, on the W. coast of Natolia, near cape Arbre; 10 miles N. of Milets.

JOTAPATA, in *Ancient Geography*, a town of Phœnicia, situated in the vicinity of Ptolemais. It was defended by Josephus the historian, but at last taken by Vespasian, in the reign of Nero, A.D. 67. Its defence lasted for seven weeks, and 40,000 Jews were killed. Joseph. de Bel. Jud.

JOUAN de L'ISLE, *St.*, in *Geography*, a town of France, in the department of the North Coasts, and chief place of a canton, in the district of Dinan; 24 miles S. of St. Malo. The place contains 683, and the canton 8543 inhabitants, on a territory of 150 kilometres, in 8 communes. N. lat. 48° 12'. W. long. 2° 29'.

JOUBERT, LAURENT, in *Biography*, a learned physician, and royal professor at Montpellier, was born at Valence, in the province of Dauphiné, in France, on the 16th of December 1529, of a good family. After he had finished his school education, he went to Montpellier, where he was matriculated in the faculty of medicine on the 1st of March 1550, and took his degree of bachelor the following year. He afterwards studied at Padua, where he attended the lectures of the celebrated Fallopius, and at some other places; but returning to Montpellier, he finished his exercises, and received the degree of doctor in the year 1558. The manner in which he had performed his acts procured for him so much of the confidence and esteem of Honoré Castellan, that this professor, being summoned to court in the following year, to hold the office of first physician of Catharine de Medicis, queen of Henry II. he nominated Joubert to give the lectures in the schools during his absence; and his nomination met with the sanction of the faculty. Joubert shewed himself worthy of the honourable appointment, and acquitted himself in so distinguished a manner, that on the death of professor Rondelet in 1566, he was immediately named his successor in the chair. He was likewise the second successor of Rondelet in the dignity of chancellor, having followed Saporta in 1574. He was called to Paris by Henry III. in 1579, who entertained hopes that Joubert would be able to cure the barrenness of Louisa de Lorraine, his queen. But his attempts proved unsuccessful; and he returned to Montpellier with the title of physician in ordinary to the king, and continued to practise his profession there to the end of his life, which happened

happened on the 21st of October 1583, when he was on the road from Thoulouse.

This physician was the author of several works, and wrote with much correctness and even elegance. A collection of those, which were written in the Latin language, has been frequently reprinted under the title of "*Operum Latinorum Tomus primus et secundus*." The first edition is that of Lyons, in 1582, folio; the subsequent ones appeared at Frankfort, in 1599, 1645, and 1668, also in folio. The following have been published separately: "*Paradoxa Medica, seu de Febribus*," Lyons, 8vo. 1566; "*De Peste, Quartana, et Paralyfi*," *ibid.* 1567, 8vo. The treatise on the plague was also published in French, in 1581; "*De affectibus pilorum et cutis, præsertim capitis, et de Cephalalgia. De affectibus internis partium Thoracis*," Geneva, 1572. Lugd. 1577, 1578; "*Traité du Ris, son essence, ses causes et effets*," Paris, 1574, 1579, 8vo.; "*Medicinæ Practicæ Libri tres*," Lugd. 1577, 12mo.; "*Pharmacopœia à Joanne Paulo, sangmaistero, edita*," *ibid.* 1579, 8vo.; "*Traité des arquebuses*," *ibid.* 1581. This, however, is the third edition; the work was several times printed, and contains very correct opinions and precepts respecting the nature of gun-shot wounds; "*Guidonis de Cauliaco Chirurgia Magna*," *ibid.* 1585, with notes by the editor. The same work was translated into French, by Isaac Joubert, his son, and went through nine or ten editions; "*Traité des Eaux*," Paris, 1603, 12mo. But of all the works of Laurent Joubert, that in which he ventured to raise his voice against popular medical errors, was the most distinguished; "*Erreurs populaires touchant la Médecine*," Bourdeaux, 1579. This work made so great an impression upon the public mind, that it was printed ten successive times in the course of six months. Eloy. Dict. Hist. de la Med.

JOUER des INSTRUMENS, *Fr.* to play upon musical instruments. The French say *jouer du violon, de la basse, du hautbois, de la flute; toucher le clavecin, et les orgues; sonner la trompette; donner du cor; pincer la guitarrre*. They *play* on the violin, the violoncello, the hautbois, and the flute; but they *touch* the harpsichord and the organ; *sound* the trumpet and French horn; and *pinch* the guitar.

JOUGH-HOLES, in *Mining*, is the name, in some parts of Derbyshire, for lenticular cavities, principally in the vertical joints or in the veins, which are lined with crystals. These are called tick-holes, druses, lochs, nests, &c. in other situations. The manner in which these curious holes were formed and left is endeavoured to be explained in Mr. Farey's Report on Derbyshire, vol. i. p. 247.

JOVIALE ARCANUM. See **ARCANUM**.

JOVIALE Bezoardicum. See **BEZOARDICUM**.

JOVIAN, in *Biography*, a Roman emperor, born about the year 331, was a native of Singidunum, in Pannonia, and son of count Varronian, who had a high reputation in the state, and who was enjoying, in honourable retirement, the fruit of his long services. The son had been brought up to arms, and had obtained so much reputation as a commander, that although an avowed Christian, the emperor Julian would not suffer him to resign, upon offering to do so rather than quit his religion. On the death of Julian, in his expedition against the Persian empire, June 363, Jovian, who was but the first of domestics, was nominated to the purple. At first a few voices only saluted him with the names of Emperor and Augustus. The tumultuary acclamation was instantly repeated by the guards who surrounded the tent, and passed, in a few minutes, to the extremity of the line. No prince was ever raised to the throne under more critical circumstances. The Roman army, distressed and dispirited, was retreating from the enemy's country

towards its own frontiers, pursued and continually harassed by a much superior force. He made a disadvantageous peace with Persia, shut up the heathen temples, recalled the banished clergy, and from henceforth it was determined that Christianity should enjoy an uninterrupted triumph over heathenism. On arriving at Antioch he displayed his attachment to the orthodox doctrine, by restoring the churches to all the adherents of the council of Nice. At the same time, in order to quiet the minds of his subjects of the old religion, he issued a decree of toleration, permitting the exercise of the ceremonies of the pagan worship. He left Antioch in the winter-season, and proceeded to Constantinople. He caused some ornaments to be added to the tomb of Julian, at Tarsus, as he passed. At Ancyra he assumed the title and ensigns of the consulship, and conferred the same on his infant son. Dadastana, an obscure town, at about an equal distance from Ancyra and Nice, was marked for the fatal term of his journey and his life. After indulging in a plentiful, perhaps an intemperate supper, he retired to rest, and in the next morning he was found dead in his bed. The body of the deceased emperor was sent to Constantinople to be interred with his predecessors. His sudden death was imputed either to the effects of an overloaded stomach, or to the gas arising from burning charcoal, which had been placed in his chamber to dry the walls. This event happened in the eighth month of his reign, and in the thirty-third year of his age. Gibbon. Univ. Hist.

JOVIUS, PAUL, an eminent historian, was born at Como, in Lombardy, in 1433. Having received a good education, he went to Rome, where he wrote a work, entitled "*De Piscibus Romanis*." He had a pension from Francis I. king of France; and Clement VII. gave him the bishopric of Nocera, an office to which he did no credit, on account of his debauched manner of living. He died at Florence in 1452. His principal work is a history of his own time, which was published at Strasburgh in 1556. He also wrote the lives of illustrious men. He had a brother who wrote a history of Switzerland. Moreri.

JOULOPPED, in *Heraldry*, a term applied to the gills of a cock, when borne of a different tincture from his head.

JOULTS, in *Mining*, is applied, in Derbyshire, to pieces of spar and lead-ore intermixed, from the size of walnuts to that of the fist. Sometimes these are called knockings, or hannaway. See Farey's Derbyshire Report, vol. i. p. 369.

JOUNPORA, in *Geography*, a town of Hindoostan, in Bahar; 25 miles S.W. of Patna.

JOURA, a barren island in the Grecian Archipelago, about 10 miles in circuit; 12 miles S.W. of Andros. N. lat. 37° 37'. E. long. 24° 46'.

JOURKOU, a town of Asiatic Turkey, in Carmania; 50 miles E.N.E. of Akserai.

JOURNAL, a day-book, register, or account of what passes daily. See **DAIRY**.

JOURNAL, in *Merchants' Accounts*, is a book into which every particular article is posted out of the waste book, and made debitor. This is to be very clearly worded, and fairly engrossed. See **BOOK-KEEPING**.

JOURNAL, in *Sea Affairs*, is a register kept by the pilot, and others, wherein notice is taken of every thing that happens to the ship, from day to day, and from hour to hour, with regard to the winds, the hums, the rake, soundings, &c. in order to enable him to adjust the reckoning, and determine the place where the ship is.

JOURNAL.

In all sea-journals, the day, or what is called the twenty-four hours, begins at noon, and is counted thence twenty-four hours to the next noon: the first twelve hours, from noon to midnight, are marked with P. M. signifying after mid-day; and the second twelve hours from midnight to noon are marked with A. M. signifying after midnight; so that the ship account is twelve hours earlier than the shore account of time. There are various ways of keeping journals, according to the different notions of mariners concerning the articles that are to be entered. Some writers

direct the keeping such a kind of journal as is only an abstract of each day's transactions, specifying the weather, what ships or lands were seen, accidents on board, the latitude, longitude, meridional distance, course, and run. These particulars are to be drawn from the ship's log-book, or from that kept by the person himself. Other authors recommend the keeping only of one account, including the log book, and all the work of each day, with the deductions drawn from it. The form of the latter kind of journal, with an example of the work of a single day, is as follows:

Abstract of a JOURNAL from England towards Madeira.

Log-Board.						Remarks on Board.	
H	K.	F.	Courses.		Winds.		
2	9	6	N.W. by W. $\frac{1}{2}$ W.		S. W. $\frac{1}{2}$ W.		
4	9	2	Leeway.		2 points.		
6	9	5	S. $\frac{3}{4}$ W.		N. E. $\frac{1}{2}$ E.		
8	8	5	Leeway.		0 point.		
10	8	7	W. S. W. $\frac{1}{4}$ W.		S. $\frac{1}{4}$ W.		
12	7	2	Leeway.		2 points.		
2	8	3	N. N. E. $\frac{1}{4}$ E.		S. $\frac{1}{2}$ W.		
4	8	7	Leeway.		0 point.		
6	7	6	S. W.		S. S. E.		
8	7	2	Leeway.		1 $\frac{1}{2}$ point.		
10	7	0					
12	6	4					
Traverse Tables.							
Courses.		D.	N.	S.	E.	W.	
N. W. $\frac{3}{4}$ W.		37	22,0			29,7	
S. $\frac{1}{2}$ E.		36		35,8	3,5		
W. by S.		30		6,6		33,6	
N. by E.		31	33,6		6,6		
S. W. $\frac{1}{4}$ W.		56		37,6		41,5	
			55,6	80,0	10,1	104,8	
			D. I.	24,4	Dep.	94,7	
						M. P.	A. M.
Lizard's latitude		=	49° 57' N.		3470		
Ship's latitude		=	40° 52' N.		2691		
Diff. latitude		=	9° 05'		779		
Or		=	554 miles.				
Lizard's longitude		=	5° 14' W.				
Ship's longitude		=	15° 39' W.				
Diff. long.		=	9° 25'	=	565 m.		
Lizard bears N.			37° 45' E.				
Distance 685 miles.							
Madeira's latitude		=	32° 38' N.		2073		
Ship's latitude		=	40° 52' N.		2691		
Diff. of latitude		=	8° 14'		618		
Or		=	494 miles.				
Madeira's longitude		=	16° 51' W.				
Ship's longitude		=	15° 39' W.				
Diff. longitude		=	1° 12'	=	72 miles.		
Madeira bears		S.	6° 30' W.				
Distant 505 miles							

JOURNAL is now become a common name for newspapers, which detail the daily transactions of Europe.

JOURNAL is also used for the title of several books which come out at stated times; and give abstracts, accounts, &c. of the new books that are published, and the new improvements daily made in arts and sciences.

The first journal of this kind was, the "Journal des Sçavans," printed at Paris: the design was set on foot for the ease of such as are too busy, or too lazy, to read the entire book themselves. It seems an excellent way of satisfying a man's curiosity, and becoming learned upon easy terms; and so useful has it been found, that it has been executed in most other countries, though under a great variety of titles.

Of this kind are the "Acta Eruditorum of Leipzig;" the "Nouvelles de la Republique des Lettres" of M. Bayle, &c.; the "Bibliothèque Universelle, Choisie, et Ancient et Moderne," of M. le Clerc; the "Memoires de Trevoux, &c." In 1692, Juncker printed in Latin, an "Historical Treatise of the Journals of the Learned," published in the several parts of Europe; and Wolfius, Struvius, Morhof, Fabricius, &c. have done something of the same kind. The "Philosophical Transactions of London;" the "Memoirs of the Royal Academy of Sciences;" those of the "Academy des Belles Lettres;" the "Miscellanea Naturæ Curiosorum;" the "Experiments of the Academy del Cimento;" the "Acta Philo-exoticorum Naturæ et Artis," which appeared from March 1686, to April 1687, and which are a history of the Academy of Bresse; the "Miscellanea Berolinensia," or Memoirs of the Academy of Berlin; the "Commentaries of the Academy of Peterburg;" the "Memoirs of the Institute at Bologna;" the "Acta Literaria Suecicæ," the "Memoirs of the Royal Academy at Stockholm," begun in 1740, the "Commentarii Societatis Regiæ Gottingensis," begun in 1750, &c. &c. are not so properly journals, though they are frequently ranked in the number. Juncker and Wolfius give the honour of the first invention of journals to Photius. His "Bibliotheca," however, is not altogether of the same nature with the modern journals; nor was his design the same. It consists of abridgments, and extracts of books which he had read during his embassy in Persia. M. Salo first began the "Journal des Sçavans," at Paris, in 1665, under the name of the Sieur de Hedouville; but his death soon after interrupted the work. The abbé Gallois then took it up, and he, in the year 1674, gave way to the abbé de la Roque, who continued it nine years, and was succeeded by M. Cousin, who carried it on till the year 1702, when the abbé Bignon instituted a new society, and committed the care of continuing the Journal to them, who improved and published it under a new form. The other French journals are the "Memoirs and Conferences of Arts and Sciences, by M. Dennis, during the years 1672, 1673, and 1674;" "New Discoveries in all the Parts of Physic," by M. de Blegny; the "Journal of Physic," begun in 1684, and some others, discontinued almost as soon as begun: "Rozier's Journal de Physique," begun in July, 1771; "Annales Chimiques," &c. &c. The "Nouvelles de la Republique des Lettres," News from the Republic of Letters, were begun by M. Bayle in 1684, and carried on by him till the year 1687, when M. Bayle being disabled by sickness, his friends, M. Bernard and M. de la Roque, took them up, and continued them till 1699. After an interruption of nine years, M. Bernard resumed the work, and continued it till the year 1710. The "History of the Works of the Learned," by M. Bafnage, was begun in the year 1686, and ended in 1710. The "Universal His-

torical Library," by M. Le Clerc, was continued to the year 1693, and contained twenty-five volumes. The "Bibliothèque Choisie," of the same author, began in 1703. The "Mercury of France" is one of the most ancient journals of that country, and was continued by different hands; the "Memoirs of a History of Sciences and Arts," usually called *Memoires des Trevoux*, from the place where they are printed, began in 1701. The "Essays of Literature" reached but to a twelfth volume in 1702, 1703, and 1704; these only take notice of ancient authors. The "Journal Littéraire," by father Hugo, began and ended in 1705. At Hamburgh, they have made two attempts for a French journal, but the design failed: an "Ephemerides Sçavantes" has also been undertaken, but that soon disappeared. A "Journal des Sçavans," by M. Dartis, appeared in 1694, and was dropped the year following. That of M. Chauvin, begun at Berlin in 1696, held out three years, and an essay of the same kind was made at Geneva. To these may be added, the "Journal Littéraire," begun at the Hague in 1715, and that of Verdun, and the "Memoires Littéraires de la Grande Bretagne," by M. de la Roche; the "Bibliothèque Angloise," and "Journal Britannique," which were confined to English books alone. The Italian journals are, that of abbot Nazari, which lasted from 1668 to 1681, and was printed at Rome. That of Venice began in 1671, and ended at the same time with the other: the authors were Peter Moretti, and Francis Miletiti. The "Journal of Parma," by Roberti and father Bacchini, was dropped in 1690, and resumed again in 1692. The "Journal of Ferrara," by the abbé de la Torre, began and ended in 1691. "La Galerio di Minerva," begun in 1696, was the work of a society of men of letters. Signior Apostolo Zeno, secretary to that society, began another journal in 1710, under the protection of the grand duke: it was printed at Venice, and several persons of distinction had a hand in it. The "Fatti Eruditi della Bibliotheca Volante," were published at Parma. There has appeared since, in Italy, the "Giornale del Letterati."

The principal among the Latin journals is that of Leipzig, kept under the title of "Acta Eruditorum," begun in 1682: P. P. Manzani began another at Parma. The "Nova Literaria Maris Baltici," lasted from 1698 to 1708. The "Nova Literaria Germanicæ," collected at Hamburgh, began in 1703. The "Acta Literaria ex Manuscriptis," and the "Bibliotheca Curiosa," began in 1705, and ended in 1707, are the work of Struvius. Messrs. Kutter and Sike, in 1697, began a "Bibliotheca Novorum Librorum," and continued it for two years. Since that time there have been many Latin journals; such, besides others, is the "Commentarii de Rebus in Scientia Naturali et Medicini gestis," by M. Ludwig. The Swiss journal, called "Nova Literaria Helveticæ," was begun in 1702, by M. Scheuchzer; and the "Acta Medica Hafnensia," published by T. Bartholin, make five volumes, from the year 1671 to 1679.

There are two Low Dutch journals; the one under the title of "Boeckzal van Europe;" it was begun at Rotterdam, in 1692, by Peter Rabbus; and continued, from 1702 to 1708, by Sewel and Gavern; the other was done by a physician, called Ruiter, who began in 1710. The German journals of best note are, the "Monatlichen Unterredungen," which held from 1689 to 1698. The "Bibliotheca Curiosa," begun in 1704, and ended in 1707, both by M. Tenzel. The "Magasin d'Hambourg," begun in 1748; the "Physicalische Belustigungen," or Philosophical Amusements, begun at Berlin in 1751. The "Journal of Hanover," began in 1700, and continued for two years by M. Eccard, under the direction of M. Leibnitz, and afterwards

afterwards carried on by others. The *Theological Journal*, published by M. Loefcher, under the title of "Altes & Neues," that is, Old and New. A third at Leipzig and Frankfurt, the authors Messrs. Walterck, Krause, and Groshuffius, and a fourth at Hall, by M. Turk.

The English journals are, the "History of the Works of the Learned," begun at London, 1699. "Censura Temporum," in 1708. About the same time there appeared two new ones, the one under the title of "Memoirs of Literature," containing little more than an English translation of some articles in the foreign journals, by M. de la Roche; the other a collection of loose tracts, entitled "Bibliotheca Curiosa," or a Miscellany. These, however, with some others, are now no more; but are succeeded by the "Monthly Review," which began in the year 1749, and gives a character of all English literary publications, with the most considerable of the foreign ones; the "Critical Review," which begun in 1756, nearly on the same plan: the "Anti-jacobin Review," begun in 1798; the "American Review," in 1811; the "British Critic," in 1798; the "British Review," in 1811; the "Eclectic Review," in 1805; the "Edinburgh Review," in 1803; the "London Medical Review," in 1808; the "Quarterly Review," in 1809. Besides these we have several monthly pamphlets, called *Magazines*, which, together with a chronological series of occurrences, contain letters from correspondents, communicating extraordinary discoveries in nature and art, with controversial pieces on all subjects. Of these are the following: *viz.* the "Agricultural," begun in 1799; the "Baptist," in 1809; the "Botanical," in 1786; the "British Farmer's," in 1811; the "European," in 1782; the "Evangelical," in 1793; the "Farmer's," in 1800; "Flower's Political," in 1807; "Freethinking," in 1811; "Gentleman's," in 1731; "Gospel," in 1806; "Lady's," in 1771; "Methodist," in 1777; the "Monthly," in 1796; "Musical," in 1809; "Military," in 1811; "Philosophical," in 1798; "Sporting," in 1792; "Universal," in 1747. To these may be added several other periodical publications under different titles, such as "Ackerman's Repository," begun in 1810; "Antiquarian Cabinet," in 1806; "Arcana," in 1810; "Army List," in 1809; "Christian Observer," in 1802; "Christian Guardian," in 1809; "Dramatic Censor," in 1811; "Edinburgh Medical Journal," in 1805; "General Chronicle," in 1811; "La Belle Assemblée," in 1806; "Lady's Museum," in 1798; "Literary Panorama," in 1806; "Medical Observer," in 1809; "Medical Compendium," in 1809; "Medical Journal," in 1799; "Monthly Repository," in 1806; "Military Chronicle," in 1810; "Naturalist's Miscellany," in 1789; "Naval Chronicle," in 1799; "Nicholson's Journal," in 1802; "Philanthropist," in 1810; "Repository of Arts," in 1794; "Retrospect," in 1806; "Relector," in 1810; "Satirist," in 1807; "Scourge," in 1811; &c. &c.

JOURNCHOPPERS, in our *Old Writers*, regrators of yarn; which formerly, perhaps, was called *journ*. They are mentioned in the stat. 8 Hen. VI. c. 5.

JOURNET, FRANÇOISE, in *Biography*, one of the greatest actresses that has appeared on the stage of the French serious opera. She was at first admired for the melliflence of her voice, her noble figure, and the charms of her action. She had an air and carriage so striking, and something so interesting and touching in her countenance, that she drew tears from those who only looked at her in the part of Iphigenia. She had eyes and arms which guided to the heart all the expression of what she had to paint.

She quitted the stage in 1720, after fifteen years applause and admiration, and died in 1722. *Essais sur la Musique.*

JOURNEY, in *Husbandry*, signifies as much ground as can be ploughed over in a day, though it is not applied in the same way in all districts, or has the same signification, as in some it is used to express a much less proportion of labour. It often signifies the length of time the team is engaged in labour, either in ploughing or any other sort of work. With all horses under team labour, great attention should be paid by the person who has the care of them, in feeding and dressing them. See TEAM.

JOURNEY, *Sabbath-day's*. See SABBATH.

JOURNEY-MAN, formed from the French *journée*, a day's work; anciently signified a person who wrought with another by the day; though now, by the statute, it extends to those likewise who covenant to work with another in their occupation or trade by the year.

JOUTRA, in *Geography*, a town of Sweden, in Tavastland; 65 miles N.E. of Tavasthus.

JOUVENCY, JOSEPH, in *Biography*, a learned Jesuit, was born at Paris in 1643. He entered the society of Jesus in 1659, and was chosen professor of rhetoric in its seminaries, first at Caen, then at La Fleche, and finally at Paris, where he taught with great reputation for nearly twenty years. He was invited to Rome in 1699, to assist in writing the continuation of the history of the society, and died in that city in 1719. His part of the history of the Jesuits comprises the period from 1591 to 1616, and was printed in folio in the year 1710. As a philologist he is known by his "Latin Harangues delivered on different occasions," in two volumes, 12mo.: "Appendix de Diis et Heroibus Poeticis," which is a compendium of the heathen mythology: "Notes on Terence, Ovid, Horace, Persius, Juvenal, Martial, and some of the works of Cicero." He gave also a Latin version of the first Philippic of Demosthenes. He is said to have displayed, in his several works, great purity, elegance, and facility of style, for which he is more distinguished than for novelty or depth of thought. Mereri.

JOUVENET, JOHN, an historical painter, born at Rouen, in Normandy, in 1644. He received his first instructions from his father; but his principal teacher was Poussin, and his most useful studies the works of that master.

He had a ready invention, and was therefore employed to adorn the apartments of Versailles and the Trianon. In the Hospital of the Invalids at Paris, he painted the twelve apostles; each figure 14 feet high. It must be acknowledged, however, that he failed in true taste. His style partakes too much of French flippancy; the substitution of something striking for what is solid and good; and his colouring is heavy. It is said, that, being deprived of the use of his right hand by paralysis, he painted ever after with his left. He died in 1717.

JOUVENU, in *Geography*, a town of France, in the department of the Saone and Loire, and chief place of a canton, in the district of Macon. The place contains 1460, and the canton 10,491 inhabitants, on a territory of 165 kilometres, in 23 communes.

JOUX la VILLE, a town of France, in the département of the Yonne; 9 miles N. of Avallon.

JOUX, *Mont*, a part of mount Jura, near the source of the river Doubs, on the borders of Switzerland, and that part of the canton of Berne which borders on France.

JOUX, a lake of Switzerland, in the canton of Berne, situated on a part of mount Jura; 4 miles W. of Romainmotier.

JOWA TOWN, *Lower*, a town of North America, on the

E. side of the river Mississippi; which, between twenty and thirty years ago, could furnish 300 warriors. N. lat. $40^{\circ} 30'$. W. long. $91^{\circ} 15'$.—The *Upper Jowa town* is about 15 miles below the mouth of the river Jowa, on the E. side of the Mississippi, and could formerly furnish 400 warriors.

JOWAN el MUGRAH, a town of Algiers; 30 miles S.W. of Setcef.

JOWGONG, a town of Bengal; 18 miles S.E. of Burdwan.

JOWRASSER, a town of Hindoostan, in Oude; 16 miles S.E. of Lucknow.

JOWRIES, a cluster of small islands in the Mediterranean, near the E. coast of Tunis, opposite to Lempta, anciently called Tarichie, and thought by Cæsar to be of so much importance, that he appointed several stationary vessels to secure them. N. lat. $35^{\circ} 38'$. E. long. $10^{\circ} 56'$.

JOY, in *Ethics*, is that passion which is produced by love, regarding its object as present, either immediately or in prospect; in reality or imagination. This passion has been found to increase the perspiration and urine of human bodies. See PLEASURE and PAIN.

JOYEUSE, in *Geography*, a town of France, in the department of the Ardèche, and chief place of a canton, in the district of L'Argentiere, 21 miles S.S.W. of Privas. The place contains 1074, and the canton 12,616 inhabitants, on a territory of $212\frac{1}{2}$ kilometres, in 18 communes. N. lat. $44^{\circ} 29'$. E. long. $4^{\circ} 19'$.

JOYNAGUR, a town of Meckley; 8 miles N.W. of Munnypour.

JOYNARANSHAUT, a town of Bengal; 18 miles E.N.E. of Islamabad.

JOYNER'S PRESS. See PRESS.

JOYNERY, the art of working in wood, and of fitting or joining various parts or members of it together.

The French call it *menuiserie*, from *minutaria*, small work; by which it is distinguished from *carpentry*, which is conversant in the larger and less curious work. See JOINERY.

JOYNERY, *Column of*. See COLUMN.

JOYPOUR, in *Geography*, a town of Bengal; 18 miles E.N.E. of Islamabad—**Allo**, a town of Assam; 16 miles S.S.E. of Gentia.

JOZE, *St.*, a town of Brazil, on the Tapajos; 45 miles S. of Paxis.—**Also**, a town of Brazil, in the government of Minas Geraes; 80 miles S.W. of Villarica.—**Also**, a town of Brazil, in the government of Goyas; 75 miles E.N.E. of Villa Boa.

JOZE, *St. de Dera*, a town of Brazil, on the Rio Negro; 205 miles from Fort Rio Negro.

Jozé Azu, a town of Brazil, in the government of Para; on the river Tocantin; 70 miles S.W. of Para.

JOZO, in *Ichthyology*, the name of a small sea-fish, of the sea-gudgeon, or rock-fish kind, common in the Mediterranean, and called *gobius albus* by some authors. It is brought to market at Rome and Venice. See GOBIUS.

JOZZI, GIUSEPPE, in *Biography*, an Italian opera singer of the second class, with a soprano voice, came into England with Monticelli, at the beginning of lord Middlesex's regency in 1742. He was a much better performer on the harpsichord than a singer. He gained great reputation here by his very accurate, brilliant, and expressive manner of executing Alberti's lessons, and a considerable sum of money by printing and selling them as his own compositions.

IPAM, in *Geography*, a town of Africa, on the Gold coast; 30 miles S.W. of Acta.

IPANEMA, a town of Brazil; 160 miles S.W. of Fernambuco.

IPECACUANHA, or **IPECACUANHA**, in *Pharmacy*, a
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little wrinkled root about the thickness of a moderate quill, brought hither from several parts of the West Indies; much used as an emetic, and against diarrhoeas and dysenteries.

The first European who brought this root into use was an apothecary of Brazil, whose name was Michael Tristaon. The book which the author published on this subject falling into the hands of the English, is translated into our language, and stands, among a number of like accounts, among Purchas's Pilgrims.

He says it is an excellent remedy against dysenteries and fluxes of all kinds. He says also, in its description, that the stalks are a quarter of a yard long, and the roots nearly as much; and that the leaves grow only four or five upon a plant.

This agrees very well with all that we have since discovered of this plant: and the method of using it at that time, we find, was not as a vomit; but they bruised the fresh root, and steeped it about twelve hours in water, at the end of which time the patient drank the water early in the morning: it operated by stool; but after its operation, the natural purging and voiding of blood ceased. This seems the original account we have of this drug. De Laet, from this, compiled his account, which is almost a literal translation of this into Latin: from his hint Piso and Marggrave enquired after it more carefully upon the spot, and from them came the first accurate accounts we had of it; so that all seems, *ab origine*, deduced from Michael Tristaon's account of it. Miller apprehends that the plant which furnishes the true ipecacuanha belongs to the genus of *Triosteum*, or *false ipecacuanha*. It is, as some have thought, the *Psychotria emetica* of Linnæus the younger. But the authority on which Mutis received the information is not to be implicitly followed.

Piso divides this root into two sorts, the white and the brown; or, according to Geoffroy, the Peruvian and Brazilian ipecacuanha: but three sorts, says Dr Woodville, are distinguishable in our shops; *viz.* ash-coloured or grey, brown, and white. The *ash-coloured* is brought from Peru, and is a small wrinkled root, bent and contorted into a great variety of figures, brought over in short pieces full of wrinkles and deep circular fissures, down to a small white woody fibre that runs in the middle of each piece; the cortical part is compact, brittle, and appears smooth and refinous upon breaking; it has very little smell, the taste is bitterish and sub-acrid, covering the tongue, as it were, with a kind of mucilage. The *brown* is small, somewhat more wrinkled than the foregoing; of a brown or blackish colour without, and white within: this is brought from Brazil. The *white* sort is woody, has no wrinkles, and no perceptible bitterness in taste. The first, that is, the ash-coloured or grey ipecacuanha, is that usually preferred for medicinal use. The brown has been sometimes observed, even in a small dose, to produce violent effects. The white, though taken in a large one, has scarcely any effect at all.

There are divers false species of ipecacuanha, or roots, which, on account of their external appearance, bear the denomination of ipecacuanha, and are sometimes sold for it. Dr. Douglas mentions two: the one white, resembling the true white, only larger in size, straighter, and softer to the touch; the other brown, of a deeper colour than the true brown, and sometimes mixed with red, whence it has also been called red ipecacuanha. These are both produced in Maryland and Virginia, where they are used as vomitives by the lower sort. Sir Hans Sloane has discovered that the latter is no other than the root of a poisonous apocynum, described by him in his Natural History of Jamaica. See Phil. Trans. N^o 410.

The genuine ipecacuanha has scarcely any smell, unless
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during its pulverization, or infusion in liquors, when it emits a faint nauseous one. Geoffroy observes, that in pulverizing considerable quantities, the finer powder that flies off is apt to affect the operator with difficulty of breathing, a spitting of blood, a bleeding at the nose, or a swelling and inflammation of the eyes and face, and sometimes of the throat; which symptoms go off in a few days, spontaneously, or by the aid of venesection.

Dr. Irving ascertained by experiments, that this root contains a gummy and resinous matter, and that the gum is in much greater proportion, and is more powerfully emetic, than the resin: that the cortical part is more active than the ligneous; and that the whole root manifests an antiseptic and astringent power. He also found its emetic quality to be most effectually counteracted by means of the acetous acid, inasmuch that 30 grains of the powder, taken in two ounces of vinegar, produced only some loose stools.

The bark of ipecacuanha is said to be preferable to its root, as an emetic; acting equally well, and with equal safety, in a smaller dose, either in powder, or infusion. Six grains of the bark, infused for a night in an ounce and a half of old Rhenish, proves a good emetic. See Phil. Trans. N. 476. sect. 10.

The brown ipecacuanha yields, by distillation, a smaller quantity of oil than the grey; and the last portion of the spirit which comes over with the oil, on urging the fire to the greatest violence, though it be considerably acid to the taste, yet does not seem to contain less, but rather more volatile particles than the spirit drawn in the same manner from the grey. On mixing the spirits of both kinds also with salt of tartar, the volatile parts of that from the brown escape with more rapidity than those from the spirit of the grey, and affect the nose more sensibly.

It is rational to conclude from hence, that if the brown ipecacuanha contains less oil than the grey, it also contains less resin; and that as this last portion of spirit contained more volatile parts, it must naturally be expected that it should prove more violent in its operation than the grey. This observation also, which is countenanced by fact, may in some degree favour the opinion of those who affirm, that the purgative virtues of medicines are excited by a volatile salt, and that they are more or less violent, as they contain more or less of this salt.

The brown ipecacuanha, as well as the grey, will afford two sorts of extracts, a resinous and a saline one; but both these are yielded in a smaller quantity from the brown than from the grey, and consequently the residuum is always greater from the brown. Eight ounces of the grey ipecacuanha yield, with spirit of wine, ten drams of the resinous extract; the same quantity of the brown, treated in the same manner, yields only six drams. From the residuum of this quantity of the grey kind, thus divested only of its resin by the spirit, there may be procured, by a watery solvent, two ounces of a saline extract; but the residue of the same quantity of the brown will yield only five or six drams of this extract, by the same treatment. The residue of the grey, thus divested of its resinous and saline parts, will weigh four ounces; and the residue of the brown, after the same treatment, will weigh six ounces. Hence it is very evident, that the active principles are much more abundant in the grey than in the brown kind of this useful root.

Neumann says that sixteen ounces of good ipecacuanha will yield three ounces of resinous matter, in which its virtue consists, by means of spirit of wine; and from the same quantity, by means of water, five ounces of gummy matter were extracted.

If the process of this analysis be varied, and the watery

menstruum used first, the proportion of the saline extract will be greatly increased by it, and that of the resinous greatly diminished; eight ounces of the grey ipecacuanha, thus treated, yielding three ounces and a half of saline extract, and only thirty-six grains of the resinous one afterwards by spirit of wine; and the same quantity of the brown yielding one ounce and three drams of the saline extract, and only twenty-four grains of the resinous one, by means of spirit of wine afterwards used. From all this it is easy to perceive, that the brown ipecacuanha contains much less of the active parts, and much more of the terrestrial, than the grey; and yet it is equally certain from trial, that the brown is much more violent in its operation than the grey.

This seems a perplexing sort of paradox; but to explain it we must remember, that the virtues of medicines are not to be measured by their bulk nor their weight, the most powerful of all acting in the smallest quantities. It has been observed, that the last portion of spirit drawn from the brown is more pungent and strong than that from the grey; and probably this part of the root has as much power to irritate the internal parts of the intestines as the resinous parts.

The best menstruum for extracting the entire virtue of the root, appears to be a mixture of one part of pure spirit, with two or three parts of water. In the shops, wine is employed: an ounce of the root is macerated or digested in a pint of Canary, or fifteen ounces of mountain, to which some add a quarter of an ounce of dried orange-peel. These tinctures, in doses of from half an ounce, or less, to an ounce and upwards, prove mildly emetic. Lewis Mat. Med.

It has been found by experience, that this is the mildest and safest emetic with which we are acquainted; having this peculiar advantage, that if it does not operate by vomit, it readily passes off by the other excretories. It was first introduced to us with the character of an almost infallible remedy in dysenteries and other inveterate fluxes, as diarrhoea, menorrhagia, and leucorrhoea, and also in disorders proceeding from obstructions of long standing; nor has it lost much of its reputation by time. The use of ipecacuanha in these fluxes is thought to depend upon its restoring perspiration; for in these cases, especially in dysentery and diarrhoea, the skin is dry and tense; and while the common diaphoretics usually pass off by stool, small doses of this root have been administered with the best effects, proving both laxative and diaphoretic. Dr. Cullen attributes its good effects entirely to its purgative quality. In common cases of dysentery, it is said soon to perform a cure, by bringing on a free diaphoresis, or plentiful sweat, after the patient has taken a puke or two, and is covered up warm in bed. In putrid or malignant dysenteries, it requires to be continued for several days, and repeated as an evacuant, with the assistance of rhubarb, cordial antiseptics, and mild opiates, or astringents. In cases requiring plentiful evacuation, or when the offending matter is lodged deep, sir John Pringle recommends it to be given in small doses, and repeated at proper intervals, till vomiting and purging come on.

In the spasmodic asthma, Dr. Akenhead remarks, that when nothing contraindicates repeated vomiting, he knew no medicine so effectual as ipecacuanha. In violent paroxysms, a scruple procures immediate relief. When the complaint is habitual, from three to five grains every morning, or from five to ten every other morning, may be given for a month or six weeks. This medicine has been also successfully used in hæmorrhages. Several cases of menorrhagia are mentioned by Dahlberg, in which one-third or half

half of a grain was given every four hours, till it effected a cure. These small doses are likewise found of great use in catarrhal and even consumptive cases, as well as in various states of fever. Dr. Cullen (Mat. Med. vol. ii.) informs us, that he knew a practitioner who cured intermittents by giving five grains of ipecacuanha, or enough to excite nausea, an hour before the accession of the fit was expected; and that Dr. Thompson, formerly of Montrose, proposed to cure agues by the employment of emetics given at the time of accession, or at the end of the cold stage; and this practice has also been successful, and may indeed be executed by tartar emetic: but in trying such practices, the ipecacuanha was found more manageable than the other, and generally more easy to the patient. Woodv. Med. Bot.

IPECACUANHA, *Baslard*, in *Botany*, is a species of *asclepias*, or swallow-wort.

IPECACUANHA, *Falfe*, or Dr. Tinkar's weed, from his having been one of the first persons who brought the root into use. See **TRIESTEUM**.

IPECA-GUACA, in *Ornithology*, the name of a Brazilian species of duck. It is of a middle size between the duck and goose, and is kept tame there for breeding and eating. It will fatten as well on dry land as when it has the use of water, and lays a vast number of eggs.

IPECATI-APOA, the name of a Brazilian species of duck called *pata* by the Portuguese; the word in that language expressing goose. It is nearly of the size of the goose, but is exactly of the shape and figure of the common duck. It is very common in the Brazilian rivers, and is fleshy and well tasted.

IPECU, the name of a Brazilian bird of the wood-pecker kind, called by Mr. Ray, *picus varius Brasiliensis*. It is of the size of a common pigeon. Its beak is straight, and very hard and sharp, and it pierces the bark and wood of trees with it, in the same manner as the European kinds. See *Picus lineatus*.

IPEK, in *Geography*, a river of Servia, which rises in mount Hæmus, and runs into the Danube, near Galombatz.

IPERSHEIM, a town of Germany, in the county of Schwarzenburg; 13 miles S.W. of Schainfeld.

IPERUQUIBÁ, in *Ichthyology*, a name by which some have called the *remora*, or sucking-fish; called also by the Portuguese, *pieve pogador*, and *pieve piolho*. See **ECHINUS**.

IPHICRATES, in *Biography*, a celebrated Athenian general, was born in a humble rank of life; but by improving the situation in which he was thrown, he, at an early age, raised himself to a high military command. As he advanced in the army, he shewed himself a strict disciplinarian, and attentive to every circumstance of military improvement. He made war against the Thracians, obtained some victories over the Spartans, and assisted the Persian king against Egypt. He changed the dress and arms of his soldiers, and rendered them more alert and expeditious in using their weapons. In the social war, a fleet was fitted out by the Athenians for the recovery of Byzantium, under the joint commands of Iphicrates, Timotheus, and Chares. The two former differed from the latter on his proposal to attack the enemy's fleet during a violent storm, and were in consequence charged by him with treasonable intentions. They were recalled by the people of Athens, and publicly prosecuted. Timotheus was condemned, and went into exile: Iphicrates defended himself with great spirit, and was acquitted. He was indebted for this not only to his eloquence, but to the menacing appearance, round the tribunal,

of several military partizans. When reproached for allowing and encouraging so violent a proceeding, he replied, "I have long borne arms for the safety of my country, and should be a great fool not to employ them to save myself." From this time, however, he ceased to serve in the army. He lived to a great age, and saw his countrymen fully reconciled to him. He left one son, named Menetheus, by the daughter of the king of Thrace. Univer. Hist. Corn. Nepos.

IPHOFEN, in *Geography*, a town of Germany, in the duchy of Wurzburg; 15 miles E.S.E. of Wurzburg.

IPIALES, a town of South America, in the province of Popayan; 36 miles S. of Palto.

IPOMŒA, in *Botany*, so called by Linnæus, from *ipō*, which he unaccountably mistakes for the *Convolvulus* plant, whereas it means a creeping sort of worm that infests and corrodes vines; and *ipōs*, like. By this appellation he evidently intended to express the close resemblance of *Ipomœa* to the genus *Convolvulus*, with which it agrees in habit altogether. Linn. Gen. 87. Schreb. 116. Willd. Sp. Pl. v. 1. 879. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. ed. 2. v. 1. 338. Brown. Prodr. Nov. Holl. v. 1. 484. Juss. 134. Lamarck Illustr. t. 104. (Quamoclit; Tourn. t. 39.) Class and order, *Pentandria Monogynia*. Nat. Ord. *Campanacea*, Linn. *Convolvuli*, Juss.

Gen. Ch. Cal. Perianth inferior, oblong, small, in five deep segments, without any appendages, permanent. Cor. of one petal, funnel-shaped, or bell-shaped; tube somewhat cylindrical, very long; limb five-cleft, spreading, with five plaits. Stam. Filaments five, awl-shaped, nearly the length of the corolla; anthers roundish. Pist. Germen superior, roundish; style thread-shaped, the length of the corolla; stigma capitate, nearly globose, in two or three lobes. Peric. Capsule roundish, of two or three cells. Seeds few, large, roundish, sometimes hairy.

Ess. Ch. Calyx deeply five-cleft, naked. Corolla with five plaits, somewhat funnel-shaped. Stigma capitate and globose, lobed. Capsule of two or three cells. Seeds two in each cell.

A large genus, more correctly distinguished from *Convolvulus* by the globose form of its stigma, than by the more narrow or tubular shape of the corolla. For want of attending to this, Linnæus and others have misplaced several species. Jacquin in his *Colletanea*, v. 3. 303, has called the attention of botanists to this subject, and Mr. R. Brown in his *Prodromus* has recently thrown further light upon it, indicating, moreover, the want of bracteas or appendages to the calyx in *Ipomœa*, which are found in *Convolvulus*.

Examples of *Ipomœa*, eminent for their beauty, are *I. Quamoclit*, Linn. Sp. Pl. 227. Curt. Mag. t. 244, a native of the East Indies, remarkable for its finely pectinated leaves, and rich crimson blossoms:—*I. coccinea*, Linn. Sp. Pl. 228. Curt. Mag. t. 221, found in the West Indies, and easily cultivated, as an annual, in our gardens:—*I. Bonanox*, Linn. Sp. Pl. 228. Curt. Mag. t. 752, found also in the West Indies, and rarely seen with us. The flowers of the last are large and white; we should from the name, as well as their appearance, guess them to be fragrant in an evening.

IPOMŒA, in *Gardening*, comprehends plants of the herbaceous flowery kinds; of which the species chiefly cultivated are the winged-leaved ipomœa (*I. quamoclit*), and the scarlet-flowered ipomœa (*I. coccinea*).

Of the second species there is a variety with orange coloured flowers.

Method of Culture.—These plants are increased by sowing the well-ripened seeds in small pots, plunging them in a mild

hot-bed, or in the earth of the bed, in the early spring months, proper air and water being given. When the plants have attained some growth, and in the first fort begin to climb, they should be removed, with balls of earth about their roots, into the places where they are to grow; or, which is better for the first kind, into separate large pots, replunging them in the bark hot-bed. They should have proper sticks set for them to twine about; some pots of the first kind being placed in the stove, as being more tender in their nature.

The first fort affords variety in the stove, and among other tender potted plants in the summer; and the latter, in the fronts of warm borders, as well as among the less tender potted flowering plants.

IPOMOPSIS, in *Botany*, so called, by Michaux, from *ipso*, to strike forcibly, and *opsis*, the sight, in allusion, as it should seem, to the dazzling brilliancy of the flowers of the original species. Michaux Amer. v. 1. 141. Sm. Exot. Bot. v. 1. 23. Ait. Hort. Kew. ed. 2. v. 1. 342. Class and order, *Pentandria Monogynia*. Nat. Ord. *Campanaceæ*, Linn. *Polemonia*, Juss.

Gen. Ch. *Cal.* Perianth inferior, bell-shaped, membranous at the base; its limb in five, long, equal, linear, erect segments. *Cor.* funnel-shaped; tube cylindrical; limb in five, deep, ovate, nearly equal segments. *Stam.* Filaments five, inserted into the upper part of the tube, awl-shaped, shorter than the limb; anthers roundish, two-lobed. *Pist.* Germen superior, ovate; style thread-shaped, about as long as the tube; stigma in three, deep, oblong, downy, spreading segments. *Peric.* Capsule rather shorter than the calyx, ovate, obtuse, of three cells, and three valves. *Seeds* several in each cell, in two rows, acutely angular.

Eff. Ch. *Calyx* in five segments, membranous at the base. *Corolla* funnel-shaped. *Stamens* springing from the tube. *Stigma* three-cleft. *Capsule* superior, of three cells and three valves. *Seeds* several, angular.

1. *I. elegans*. Scarlet Ipomopsis. Michaux Amer. v. 1. 142. Sm. Exot. Bot. t. 13. (*Ipomœa rubra*; Linn. Syst. Veg. ed. 14. 204. *Polemonium rubrum*; Linn. Sp. Pl. 231. *Ca. tua coronopifolia*; Willd. Sp. Pl. v. 1. 879. *Quamoclit pennatum erectum, floribus in thyrsum digestis*; Dill. Elth. 321. t. 241.) "Stem erect, straight. *Corolla* thrice as long as the calyx."—A native of South Carolina, whence it was originally brought to Sherard's garden at Eltham. It has occasionally been imported since from the same country, and was lately raised in great perfection at Messrs Lee and Kennedy's, where the excellent figure in exotic botany was drawn. It flowers in September or October, and consequently ripens seed with difficulty. According to all appearance this beautiful plant is a *biennial*. *Root* fibrous. *Stem* solitary, erect, becoming panicled at the height of four or five feet, round, leafy, and clothed, like the whole herbage, with short, glandular, white hairs. *Leaves* pinnatifid; segments long and narrow, those of the radical leaves shorter and broader; floral leaves simple. *Flowers* on short stalks, drooping. *Corolla* equally five-cleft, of a brilliant scarlet, elegantly dotted on the inside. *Stamens* slender, red; anthers yellow. *Germen* smooth, pale green. *Capsule* almost membranous, the partitions from the centre of the valves. *Seeds* in two rows, small, not winged.

2. *I. inconspicua*. Little Blue Ipomopsis. Sm. Exot. Bot. t. 14. Ait. Hort. Kew. ed. 2. v. 1. 342.—"Stem much branched and spreading. *Corolla* scarcely longer than the calyx. Segments of all the leaves linear."—Native of North America, and first raised, in 1793, at Sion House, by Mr. Thomas Hoy, F.L.S. It flowered in November. *Root* annual. *Stems* numcrous, about a foot high, leafy,

round, pubescent as in the last species. *Leaves* alternate, pinnatifid; segments long and narrow, generally simple. *Flower-stalks* various in length, simple, foliary or in pairs, erect. *Calyx* with rather broader teeth than the foregoing. *Corolla* blue, with a white tube, by no means striking or beautiful. *Stigma* purplish. *Capsule* ovate, thin, whitish.

Dr. Smith has observed, that this species serves to confirm the *Ipomopsis* of Michaux, with which it agrees so completely in every botanical character, that we find it not very easy to establish even a specific difference on found principles; while, on the other hand, it shews how different this natural genus is from *Cantua*, and all others to which it has been referred. The same author mentions a third species, *I. albidula*, gathered by Donibey, at Lima, much like this, but upright; its leaves doubly pinnatifid, with somewhat elliptical lobes, and its flowers whitish.

IPPO, in *Natural History*. See *MACASSAR Poison*.

IPS, in *Geography*, a town of Austria, situated near the conflux of the Ips and Danube, on the site of the ancient Pons Iliis, on Ispontium; 48 miles W. of Vienna. N. lat. 48° 13'. E. long. 15° 5'.

IPSALA, or **SKIPSILAR**, a town of European Turkey, in Romania; 53 miles S.W. of Adrianople.

IPSARA, called by the ancients *Pyrgæa* or *Pyrgia*, an island in the Grecian Archipelago, about six miles long and three wide; the soil is in general stony, and affords no great resources to agriculture and commerce. It, however, produces figs, grapes, a small quantity of cotton, and some corn, and red wine is an article of commerce. The inhabitants are chiefly Greeks, about 1000 in number, who pay a tribute of about 1000 crowns, and are subject to the cadi of Scio; six miles N.W. of Scio. N. lat. 38° 43'. E. long. 25° 35'. About a league from Ipsara lies a smaller and desert island, called "Anti-ipsara, scarcely two leagues in circumference. Between these two islands ships find a very good anchorage.

IPSHEIM, a town of Germany, in the principality of Culmbach; 17 miles N.N.W. of Anspach.

IPSILLI, a small island in the gulf of Engia.

IPSUS, in *Ancient Geography*, a town and river of Asia, in Phrygia, S.E. of Synnada; famous for a battle fought here in the year 300 B.C. between Antigonus and Demetrius, having an army of 70,000 foot, 10,000 horse, and 75 elephants, and the kings of Seleucus, Lyfimachus and Cassandra, who had 74,000 infantry and 10,500 cavalry, 400 elephants, and 20 chariots of war. Antigonus was defeated and killed. Demetrius fled into Greece. The conquerors divided their lands between them.

IPSWICH, formerly called *Gippefwich*, *Gippefwid*, *Gyppewicus*, &c. in *Geography*, a borough and the county town of Suffolk, England, is seated on the northern bank of the river Orwell, at the distance of 18 miles N.E. from Colchester, 54 S.W. of Yarmouth, 12 N.W. of Harwich, and 69 N.E. of London. In the year 1800, it contained 2221 houses, and 74,292 inhabitants. Near this place the river Gippen, or Gipping, unites its waters with the Orwell, which is navigable for 12 miles to the sea at Harwich, where is a commodious haven, or harbour. Ipswich appears to have been a town of some consequence during the Anglo-Saxon dynasty; for it was fortified with a vallum and fess when the Danes made their depredatory incursions into this part of the island. Within the space of ten years they pillaged this town twice: first in, or near the year 991, and again in 1000. In the fifth year of king John's reign, the fortifications were repaired and materially strengthened. The walls were provided with, at least, four fortified gates; which were respectively called, from their relative

relative situations, East-Gate, West-Gate, North-Gate, and South-Gate; and the town was also divided into four leets or wards. Some fragments and parts of the old walls are still remaining. Of the castle, no vestige is left, either to prove its site, or define its character. The liberties of the borough, however, extend beyond the walls, and comprehend the four hamlets of Stoke-Hall, Wikes-Ufford, Brooks-Hall, and Wikes-Bishop. The extent of these liberties comprises an area, measuring about four miles from east to west, and nearly five miles in a transverse direction. The corporation has also jurisdiction and advantageous privileges by water, on the Orwell to the sea-port of Harwich. In the time of king Edward the Confessor, his queen held two parts of the borough, and her brother, earl Guert, a third part. When the Domesday book was made, Roger Bigot, earl of Norwich, possessed the half hundred of Gippeswid. At the former period, there were 538 burgesses residing here, who paid custom to the king, but at the conquest there were only 110 burgesses, and in the Norman record it is stated, that "328 houses are now empty." The first charter granted to the borough is dated 25th of May 1109, 1st of king John; this grants to the burgesses, 1. "The borough with all its appurtenances, liberties, &c. to be holden of the king and his heirs by the payment of the right and usual annual farm, and 100 shillings more at the exchequer." This sum is supposed to have amounted to sixty marks, or 40*l*.: 2. The burgesses were also exempted from the payment of all taxes under the names of tholl, lestage, stallage, passage, pondage, and all other customs by land, and at sea-ports: 3. To have a merchant's gild, and hanse of their own: 4. No person to be quartered on them without consent, or any thing taken from them by force: 5. That they might hold their lands and recover their just dues from whomsoever they be owing:" which implies that the inhabitants were then constituted lawful subjects: "6. That they should hold their lands and tenures within the borough, according to the custom of the borough of Ipswich: 7. That none of them shall be fined or amerced, but according to the laws of the free-boroughs: 8. And that they might choose two bailives and four coroners out of the more lawful men of the said town." Suffolk Traveller.

After this charter was ratified and obtained, the burgesses assembled in the church-yard of St. Mary at Tower, and there held their first great court; appointed officers, &c. Here they continued to transact their public business till the 13th year of Edward I.'s reign, when that monarch seized the borough, and held it in subordination for six years. He then renewed and confirmed the charter, by public act, dated at Berwick, A.D. 1291. For this liberty the burgesses were required to pay an annual rent of 60*l*. to the king. Another charter was granted by king Henry VI.; but the most material act of this kind was procured in the 17th year of king Charles II. Among the privileges conferred on the burgesses by these charters, is that of sending two members to parliament, who are elected by the votes of about 700 burgesses. The officers of these, and who are entrusted with the civil government of the place, are two bailiffs, a recorder, 10 portmen, and 24 common-councilmen. The borough is said to have returned members *ab origine*. Like the generality of parliamentary boroughs, this has been the cause of much bribery, corruption, and litigation. A memorable instance of the latter occurred before a committee of the house of commons in 1780, when Mr. Cator, who had obtained a majority of votes by bribery, &c. was declared disqualified to take a seat in the house, and a new writ was issued to elect another person. The particulars of

this case are fully narrated in Oldfield's "History of Boroughs," vol. ii.

In addition to the privileges already noticed, the corporate officers of Ipswich are authorized to pass fines and recoveries, try civil and criminal causes, and hold pleas of the crown. They also hold assizes of wine, bread, beer, &c. and have an admiralty jurisdiction, whereby they are entitled to all waifs, strays, and goods cast on shore. No freeman can be compelled to serve on juries out of the town; and every burgess is entitled to several advantageous privileges on sailing to different ports.

Ipswich at present contains twelve parish churches. In the Domesday book nine are specified: and in the year 1287 it is related in Stowe's Annals that some churches in this town, at Yarmouth, at Dunwich, &c. were destroyed by a violent storm, and by the waves of the agitated sea. The names of the present parishes, are, 1. St. Clement's, which is consolidated with St. Helen's, and has no church: 2. St. Helen's, or Hellen's, is a rectory: 3. St. Lawrence's church is said to have been begun by John Bottold, who died A.D. 1431. The chancel was erected by John Balwyn, who died in 1449; and a chantry was founded here, in 1514, by Edmund Dauntry, a postman of this town, who also caused the market cross to be built: 4. St. Margaret's was appropriated to the priory of the Holy Trinity, the church of which was formerly standing near St. Margaret's church-yard: 5. St. Mary's, at Elms: 6. St. Mary's, at Kay: 7. St. Mary's, at Stoke: 8. St. Mary's, at Tower: 9. St. Matthew: 10. St. Nicholas's: 11. St. Peter's: 12. St. Stephen's. Besides these, the three following churches are in the vicinity of the town: 1. Thurleston: 2. Whitton: and 3. Westfield. The monastic establishments within the town were formerly very numerous, and several houses, parts of buildings, and places, still retain the names of the respective societies. These were, 1. The Holy Trinity, or Christ Church, a priory of Black canons: 2. St. Peter and St. Paul, a priory of Black canons: 3. St. Mary Magdalen, and St. James, a hospital for leprous persons: 4. Dandy's Alms-houses: 5. A house of Austin friars: 6, 7, and 8. Black friars, Gray friars, and White friars. For accounts of these establishments, see Tanner's Notitia Monastica.

Ipswich formerly contained several large houses belonging to wealthy merchants and eminent persons. Of these a few remain in reduced and dilapidated conditions. Among these are walls and a brick gateway to a building called Wolfey-college, which was appropriated and enlarged by Cardinal Wolfey for a dean, 12 secular canons, 8 clerks, and 8 choiristers. To this college was annexed a grammar school; but before the founder's design was carried into effect he was arrested by king Henry VIII. and is supposed to have taken poison to escape an ignominious trial and execution. The site of the college comprised about six acres of land. The bishop of Norwich had a palace called Curson's-house, in Silent-street. Sir Andrew Windsor, afterwards lord Windsor, had a house in the parish of St. Mary, at Stoke. The archdeacon of Suffolk possessed a house, called Place or Palace, in Upper Brook-street. Part of the outer wall and gates lately remained. In the parish of St. Stephen were formerly two houses, or mansions of considerable note: one of which belonged to, and was inhabited by Charles Brandon, duke of Suffolk; and the other to sir Anthony Wingfield, knight of the Garter, vice-chamberlain and privy-counsellor to king Henry VIII. Some apartments of the latter still remain, and are curious examples of the style in which such mansions were ornamented. Several little houses in this town are embellished, both externally

ternally and internally, with carved and stuccoed devices; but these are chiefly of the age of James I. and Charles I.

The commerce and trade of Ipswich, though not upon a large scale, furnish employment to many of the poorer inhabitants, and fortunes to those who possess property to speculate with. Several vessels belong to this town, and many have been built here. Four building yards are attached to the port. The chief trade of the place is malt-ing. Ipswich is supplied with five fairs annually, and five days out of the seven are appropriated for markets. For the accommodation of persons frequenting these, a large, commodious market-place has been erected from designs by Mr. Brown, an architect of this town. A series of buildings, on pillars, is disposed round two quadrangular courts, in which persons who frequent the market may be provided with shelter and accommodation for a small annual, or weekly rent. The plan is judicious, and admirably adapted to its purpose. In this town are five charity-schools for the education and clothing of poor children.

On the quay is a custom house: it was determined in the reign of Edward III. that the bailiff and burgesses of Ipswich had the sole right to take custom-house duties for goods landed at the port of Harwich: whence it is inferred that the latter was a subordinate, and dependant port to the former. The tide commonly rises from 10 to 12 feet: but at low water the river is shallow and narrow. At Ipswich are the following public buildings: a town-hall, council-chamber, and shire-hall; a workhouse, or hospital, and some alms-houses.

Adjoining the town is a seat and park called Christchurch, occupying the site and lands of an ancient priory; and to the south of Ipswich are the following seats: Tattington-hall, Wolverston-hall;—to the west are Chantry, Sproughton, Brnital, and Bramford, Hintlesham-hall, Stoke-hall, and Hill-house. Among the eminent natives of this town, the name of Thomas Wolsey is particularly distinguished. He is said to have been the son of a butcher, but this is doubted by the editor of the second edition of "The Suffolk Traveller." It is evident, however, that he rapidly advanced from a low rank in society, to be even the master of his tyrannical and selfish monarch; but at length he fell a sacrifice to his own ambition and to the caprice of his king. He was born here March 1471, and died at Leicester Nov. 29, 1530. Several memoirs and accounts of him have been published, but an "impartial life" of him "is still a desideratum in English biography." Chalmers, in his interesting "History of the Colleges and Halls, &c. of Oxford," has given a short and discriminating memoir of him, with references to, and observations on the cardinal's different biographers. The following names occur as "worthies" of Ipswich: Ralph Brownrigg, D.D. and bishop of Exeter: William Butler, physician, who, according to Fuller, "Worthies of England," (vol. ii. p. 340.) was the Æsculapius of the age." Mr. Raw, a respectable bookseller of Ipswich, is printing a history of this town. Suffolk Traveller, 2d edit. 8vo. 1764.

IPSWICH, the Agawam of the Indians, a post-town and port of entry in America, pleasantly situated on both sides of Ipswich river, in Essex county, Massachusetts, 30 miles N.E. by N. of Boston, and about a mile from the sea. The township of Ipswich is divided into four parishes, and contains 601 houses, and 3305 inhabitants, who are chiefly farmers; a few vessels are employed in the fishery, and some few trade to the West Indies: silk, thread, and lace, of an elegant texture, are manufactured here in large quantities, by women and children, and sold for use and exportation in Boston and other mercantile towns. Ipswich township was incorporated in 1634. It was formerly a place of consider-

able importance; but its decline is attributed to a barred harbour, and shoals in the river. N. lat. 42° 43'. W. long. 70° 50'.

IPSWICH, *New*, a township in Hillsborough county, Hampshire, containing 1266 inhabitants; situated on the W. side of Souhagan river, and separated from Whatshook mountain by the N. line of Massachusetts; 56 miles N.W. of Bolton. It was incorporated in 1762, and has a flourishing academy.

IQUEIQUY, or IQUIQUE, an island in the Pacific ocean, near the coast of Peru, about a mile in circumference, situated in a small gulf, which affords shelter for vessels, but no fresh water. It is inhabited by Indians and slaves belonging to the Spaniards, who are employed in collecting a yellow earth, formed by the dung of birds, as manure for vines, and with which eight or ten ships have been loaded annually for a century. S. lat. 20 20'.

IQUISENQUI, one of the islands of Japan, situated near the S.E. coast of the island of Ximo. This island is very small. N. lat. 32. E. long. 132° 40'.

IRABAD. See HIRABAD.

IRABATTY, a name given to the river Ava, in some part of its course.

IRAC, ARABIAN, a country of Arabia Deserta, situated to the south of the Tigris and Euphrates; the ancient Babylonia or Chaldæa. This country, towards the N.E. is watered by branches of the Euphrates, and is fertile, containing a number of cities and towns: towards the S.W. it is a dreary wilderness. One of the principal places in it is Bassora.

IRAC, or *Irac-Ajemi*, a province of Persia, chiefly corresponding with the ancient Ecbatana; is bounded on the N. by Gilan and Mazanderan, on the E. and N.E. by Chorasan, on the S. by Farsistan, and on the W. by Khoristan or Chusistan, and the Arabian Irac. This province contains a part of ancient Media and Parthia: it is about 150 leagues in length, and 120 in breadth; and part of it consists of barren mountains, or sandy plains, which are altogether unproductive, but near the rivers there are extensive and fertile plains. The air is healthy, but very dry; the climate is hot; and it hardly ever rains in the summer for six months together. Mount Taurus, which traverses the province, furnishes the animal that yields musk: manna, of an exquisite whiteness, is found in several places: galbanum is collected in the mountains near Isfahan; and in several places they cultivate grapes, some of which are dried, and others afford white wine. In this province are reckoned about 40 towns or cities. Isfahan, the capital of Persia, is the chief.

IRACOUBO, a river of Guiana, which runs into the Atlantic. N. lat. 5 35'. W. long. 54° 27'.

IRACUNDUS MUSCULUS, in *Anatomy*, a name given by some authors to one of the muscles of the eye, called also the rectus exterior and abducens. It is one of the quatuor recti oculi of Albinus, and is called by him and Douglas, as well as many others, the abductor.

IRAMALLY, in *Geography*, a town of Hindoostan, in the circar of Dindigul; 30 miles W.N.W. of Dindigul.

IRAPILLY, a town of Hindoostan, in the Mysoor country; 12 miles S.E. of Sankeridurgum.

IRASBURG, a township of America, in Orleans county, Vermont, situated on Black river; 12 miles S. of the Canada line; containing 15 inhabitants.

IRASCIBLE, in the *Old Philosophy*, a term applied to an appetite, or a part of the soul, where anger and the other passions, which animate us against things difficult, or odious, were supposed to reside.

Of the eleven kinds of passions attributed to the soul, philosophers ascribe five to the irascible appetite; *viz.* wrath, boldness, fear, hope, and despair: the other six are charged on the concupiscible appetite; *viz.* pleasure, pain, desire, aversion, love, and hatred.

Plato divided the soul into three parts; the reasonable, irascible, and concupiscible parts. The two last, according to that philosopher, are the corporeal and mortal parts of the soul, which give rise to our passions.

Plato fixes the seat of the irascible appetite in the heart; and of the concupiscible in the liver; as the two sources of blood and spirits, which alone affect the mind.

IRAVAT, or IRAVATI, in *Hindu Mythology*, the name of an elephant on which Indra, the regent of the firmament, and prince of the beneficent genii, rides. (See INDRA.) It is generally painted with three trunks, or proboscis, and is driven by Indra's charioteer named Matali. The Hindus assign vehicles, which they call vahan, to their different deities, male and female. Thus, the vahan of Indra is Iravat (see VAHAN); but not, it would appear, exclusively, for Major Moore, in the *Hindu Pantheon*, p. 261, says, that he has pictures in which other deities, Rama and Krishna in particular, are mounted on this favoured animal. Indra being a personification of the visible heavens, his attributes and distinctions partake of firmamental allusions. In his wars he employs many elephants, who are in fact clouds; and their names translated mean *thunder, bearer, black, white, rumbler, growler, &c.* The chief of all these is Iravat, which means *watery*, the aqueous property of clouds being that most apparent; and we may, in this appropriate nomenclature, fancy that we discern some appearance of connection in the mythological machinery of the Hindus, generally at the first view so apparently anomalous and extravagant.

IRBEN, in *Geography*, a town of the duchy of Courland, on the coast of the Baltic; 18 miles E.N.E. of Windau.

IRBITSKAIA, a town of Russia, in the government of Perm, on the Irbit; 100 miles N.E. of Ekaterinburg.

IRCUNDA, a town of Hindoostan, in the circar of Cicacole; 20 miles S.W. of Cicacole.

IRE HOLMES, two islands among the Orkneys, a little to the W. of the island of Sanda.

IREBY, HIGH, or *Market-Ireby*, a parish and market-town in Allerdale-ward, in the county of Cumberland, England, is situated near the source of the river Ellen, 303 miles distant from London, and contained, according to the population return of the year 1800, 73 houses, and 358 inhabitants. Here are two annual fairs, and a weekly market on Thursday. The town, though now inconsiderable, is of great antiquity, and was, in the opinion of Camden, the "Arbeia of the Romans, where the Barcarii Tigrienses were stationed;" but Horsley dissents from this evidence, and asserts, that no Roman antiquities were ever found here; and that the affinity of names has less force in this instance, as there is another Ireby in Lancashire, on the borders of Westmoreland and Yorkshire. This gentleman, with Mr. Ward, places the Arbeia at Moreby, where remains have been dug up, and the site of a station is evident. *Beauties of England and Wales*, vol. iii.

IREDELL, a county of America, in Salisbury district, North Carolina, surrounded by Surry, Rowan, and Burke. The climate is salubrious, the lands beautifully variegated with hills, and the soil rich. It contains 8761 inhabitants, of whom 1481 are slaves. Iredell court-house has a post-office; 25 miles from Salisbury.

IREGA, a town of Hindoostan, in the circar of Adoni; 50 miles W.N.W. of Adoni.

IREJ, a town of Hindoostan, in the circar of Gohud; 70 miles E. of Narwa. N. lat. $25^{\circ} 37'$. E. long. $79^{\circ} 40'$.

IRELABOO, a town on the N. coast of the island of Sumatra. N. lat. $5^{\circ} 9'$. E. long. $96^{\circ} 15'$.

IRELAND, a large and fertile island in the Atlantic ocean, lying on the west of Great Britain, from which it is separated by the Irish sea, or St. George's Channel. It contains the most western land in Europe, if we except Iceland, and it has no country between it and the coast of Labrador in North America. The sea which separates it from Great Britain, varies in breadth from 14 to 40 leagues; but is contracted between Scotland and the county of Down to a channel only six leagues wide, and farther north to a still narrower strait of less than four, between the N.E. point of the coast of Antrim and the Mull of Cantyre.

The general figure of Ireland somewhat resembles a parallelogram, the greatest length of which that can be measured along a meridian, is from Bloody Farland Point, in the county of Donegal, to the Stags of Cork harbour; this does not exceed 185 Irish, or $235\frac{1}{2}$ English miles. It is much indented on the east by the Irish sea, and on the west by the Atlantic ocean, so that its breadth is very unequal. Between Emlagh Rath, in Mayo, and the mouth of Strangford lough, which is the greatest, there are 143 Irish (182 English) miles, whilst between the bays of Dublin and Galway there are but 86 Irish miles, and between Dondalk and Ballyshannon no more than 67. It will not, therefore, appear surprising, that there is not a spot in Ireland which is fifty miles distant from the sea. If a diagonal line be drawn from Fairhead, the north-easterly point, to Mirenhead, the south-western point, it will measure 241 Irish, or 306 English miles, which is the greatest distance between any two points of the island. The number of Irish plantation acres is above 12 millions, which is nearly equal to 20 millions of English acres.

The situation of Ireland is peculiarly favourable for receiving and bestowing the reciprocal benefits of external commerce. Its communication is open and direct with England, France, Spain, Portugal, the coast of Africa, the East Indies, South America, the West Indies, the United States of America, Newfoundland, Hudson's Bay, Greenland, &c., with by far the greatest part of the richest, the most fertile, the most commercial, and the most mutually dependent countries in the world; with countries abounding in an endless variety of commodities, furnishing every material on which the varied industry of man can be employed, and presenting the utmost allurements to the enterprising trader. It seems destined by nature, says Mr. Newenham, to be the great emporium of the commodities of Europe and America; and, indeed, of those of almost every maritime country upon the surface of the globe.

The face of the country affords a pleasing variety. In some parts there are rich and fertile plains, watered by large and beautiful rivers; in others frequent hills produce that interesting succession of objects with which a flat country can never abound. In two or three counties, there are most romantic and picturesque scenes, whilst in others, extensive plains have been converted into mossy morasses. A sufficient quantity of wood, however, is wanting in most parts to render the views as interesting as the general character of the country would lead us to expect. That this was not the case in former times, is evident from various accounts. Giraldus Cambrensis, quoted by Camden, Stamhurst, and other old writers, speak of it as covered with woods, which are also often referred to in acts of parliament, and other public documents.

documents. These were partly cut down to deprive the natives of their fastnesses, and partly for the purpose of extending agriculture. In the reigns of James I. and Charles I., during the continuance of peace, a very extensive exportation took place, chiefly of pipe staves and other small timber; and besides what was consumed in domestic fuel, immense quantities were charred for the iron works which were carried on in different parts of the island. As no attention was paid to renewing them, the forests were speedily reduced. Yet Boate, whose work was published about the middle of the seventeenth century, informs us that there were still sundry great woods remaining in all the provinces, some of them many miles long and broad. All these have since been demolished, and there does not exist in Ireland any tract deserving the name of a forest: but the whole country is cleared for the purposes of agriculture, and retains none of the vast woods to be found in the savage state, yet Ireland is not destitute of woods that are both useful and ornamental. A spirit of planting has been prevalent for some years past, which has been powerfully encouraged by the premiums of the Dublin Society, as well as by several acts of parliament for the protection of timber, so that the country begins to assume a less naked appearance, and will, perhaps, become once more entitled to its old name of the Woody island.

Ireland has been ever celebrated for the fertility of its soil. The richest land is that which lies near the principal rivers, but there is not much which can be called bad; and the proportion of that which is waste was not thought by Mr. Arthur Young, so long ago as the year 1778, to be as great as in England. The most uncultivated tracts are the mountainous districts in all the western counties, which seem placed as barriers against the fury of the vast Atlantic. In every part of Ireland there is stone either near the surface or at no great depth, which Mr. Young considered as the greatest singularity of Ireland. "May we not recognize in this," he continues, "the hand of bounteous Providence, which has given, perhaps, the most stony soil in Europe to the moistest climate in it? If as much rain fell upon the clays of England, (a soil very rarely met with in Ireland, and never without much stone,) as falls upon the rocks of her sister island, those lands could not be cultivated. But the rocks here are clothed with verdure; those of limestone, in particular, with only a thin covering of mould, have the softest and most beautiful turf imaginable." Light sandy soil is seldom met with, and chalk has not been found in any part of the island, though there is a white limestone somewhat resembling it.

The mountainous chains in Ireland are neither numerous nor important; but an upland ridge divides the country from the N.E. to the S.W., giving birth to several of the rivers. The Irish hills generally form short lines or detached groups, which are so dispersed through the country, that there is scarcely any part in which the prospect is not terminated by this species of majestic scenery. There are none, however, equal in height to several in Great Britain, the highest probably falling short of 3000 feet; yet there are a few, such as Mangerton and McGillicuddy's Reeks, near the lake of Killarney, and Brandon, near Dingle, in Kerry; Croagh Patrick and Nephin in Mayo; and Sliebh-Donard, one of the Mourne mountains, in the county of Down, which deserve the attention of the naturalist, as they have been found to produce many of those plants peculiar to Alpine regions.

As the whole of the country is found to have stone near the surface, it was natural to expect that it contained valuable minerals; and we accordingly find that such an expectation was early formed, though, hitherto, much pains do not

seem to have been taken to discover them, and render them useful. A plan was indeed recommended by Mr. Kirwan, which, if it had been adopted, would have established a complete mineralogical school in Ireland, and would thus have not only led to the discovery of the minerals, but have also instructed in the mode of procuring them with most advantage. As, latterly, attention has been excited to the subject, much progress may be shortly expected. The limestone quarries, which abound almost every where, are now generally worked, and afford a most valuable manure. A great variety of marbles is found, some of which are uncommonly beautiful, and capable of a very high polish, so as to leave little cause to regret the difficulty of procuring Italian marbles. Gypsum, so valuable a material in the hands of the ornamental artist, is found in great abundance near Belfast, and fuller's-earth has been found in several counties. The mountains of granite in Wicklow and Carlow supply the capital with this useful stone for building; and slates of excellent quality are found in many parts of the island. The beds of coal, to be seen in various regions of Ireland, have not yet been properly explored. That of Kilkenny, found at Castlecomer, is deservedly celebrated among mineralogists as the purest coal of the kind to which it belongs, which is the *stone* or *unflammable* coal. This is the kind generally found in the southern parts of Ireland; but in the counties of Tyrone and Antrim some mines of slate-coal have been worked. Iron ore is very abundant; and before the forests were consumed, there was a great number of iron works in various parts. Boate divides the iron mines of Ireland into three descriptions: 1. What he styles the bog-mine, or, what is now termed lowland ore, found in moors and bogs; the ore resembling yellow clay, but mouldering into a blackish sand. 2. The rock mine; a bad sort; the ore intimately combined with stone. 3. That found in various mountains; the ore spheric and of a whitish grey colour; balls of the best ore contained kernels full of small holes, whence the name honey-comb ore. Boate praises this iron as frequently rivalling that of Spain; and Mr. Kirwan affirmed, before the house of commons, that the Arigna iron was better than any iron made from any single species of ore in England. A defective supply of coal renders, however, the abundance of this ore of no avail. There are also valuable mines of lead, copper, and cobalt, some of which have been wrought to advantage; and gold has been found in the county of Wicklow, though not of such consequence as to promise much national advantage.

The bogs of Ireland form a very remarkable feature of the country. These are of different kinds, and in some places are very extensive. As trees, and even utensils of different kinds have been found in these bogs, they are supposed not to be of very great antiquity; and the most probable account seems to be, that when forests had been cut down, the trees were suffered to lie on the spot, and the cultivation of the ground neglected. These trees intercepted and confined streams of water with the various rubbish they brought with them; and became gradually covered with a vegetation of moss, sedge grass, rushes, and various aquatic plants. Notwithstanding attention was directed to the recovery of these extensive wastes more than a century ago, very little has yet been effected, which is rather to be attributed to want of proper exertion, than to such recovery being impracticable. In the year 1809, however, on the recommendation of the Right Hon. John Foster, at that time chancellor of the exchequer, who will be long remembered as a zealous promoter of the interests of Ireland, when party animosity will be forgotten, commissioners

Commissioners were appointed "to enquire into the nature and extent of the bogs of Ireland; and the practicability of draining and cultivating them." As the vast extent of these bogs has not enabled the commissioners to complete the task committed to them, it can only be observed, that the first of a number of districts contains 36,430 English acres of bog, and that the expence of the operations which a very able engineer deemed necessary for completely draining it, was 70,014*l.* 7*s.* 3*d.* The bogs in the King's county alone, exceeding 500 acres each, contain at least 124,000 acres. The drainage of these bogs is, therefore, a matter of vast importance, not only to Ireland, but to the empire at large, as these lands, now of little or no value, would, when drained and properly cultivated, yield a vast supply of food, for which England has had to pay large sums in gold to her most bitter enemy. It has also been made evident, that this drainage would increase the quantity of turf fuel, so as to render it both more easily procurable and cheaper. At present only the small bogs, which it is not intended to drain, and the edges of the large ones, are accessible to the turf-digger, but the drainage would enable an approach to the interior parts of them; and such is the quantity, that after every exertion to reclaim, there will remain more for turf than an increased consumption can possibly exhaust in the course of ages. This is an observation of much importance, because the want of this excellent fuel would be very severely felt in a country where few coal mines are worked, and where the supply of coal is consequently uncertain and expensive. The instructions of the commissioners do not authorise them to examine the numerous boggy tracts on the sides of mountains, which not being in general deep, afford at times good pasturage. The best mode of reclaiming these would be to introduce the culture of Fiorin, as recommended by the Rev. Dr. Richardson, and thus render them good meadows.

Perhaps no country of the same extent is more bountifully watered by fine rivers and lakes, or more indented by noble harbours, than Ireland is, so as to possess, in an eminent degree, those great requisites for agriculture, manufactures, and the most extensive commerce. The rivers, besides abounding with an infinite variety of fish, communicate uncommon fertility to the lands which they beautify, and afford a multitude of the best situations for the machinery of manufactures, so that wind-mills are very rarely met with in this country. But though many of these rivers are very considerable in point of size, and run a pretty long course, and some of them are capable of bearing large boats many miles above their fall into the sea; yet there are none which can be called navigable in the same sense as the Thames or the Severn. This is partly occasioned by rocks running across their beds, and thus forming cataracts; partly by the practice of breaking down the banks to make fords for the convenience of travellers, when bridges were less frequent than they are at present; and partly by weirs made either to serve mills, or for the sake of catching salmon. Much, however, may be done by labour, attention, and expence, to remove these impediments, and extend internal navigation; and so sensible was the Irish legislature of this, that a sum of money has been appropriated, under the direction of commissioners, for this purpose. The Shannon is the principal river of Ireland, which, rising in the northern part of Connaught, almost insulates that province and the county of Clare, and after a course of 150 miles, in which it expands into six different lakes, it flows into the Atlantic ocean, between the counties of Clare and Kerry, being navigable for large vessels as far as Limerick. The Suir, the

Barrow, and the Nore, which Spenser has described as three brothers, proceeding in different directions from Sliehbloom, a ridge of mountains between the King's and Queen's counties, and in the north of Tipperary, pour their united streams into the bay of Waterford.

The number of lakes or loughs in Ireland is very great, and some of them are large, and even magnificent. Many of those sheets of water, however, which are called by this name, are in reality arms of the sea, as Lough-Swilly, Lough Foyle, and others. Of those which are, strictly speaking, lakes, Lough Neagh, Lough Erne, and Lough Corrib, are the most considerable in point of extent; as Lough Lane, or the lake of Killarney, is the most distinguished for its beauties. There are also many mineral springs in different parts, the most remarkable of which will be noticed under their respective counties.

The harbours of Ireland are very numerous. These have been divided into the principal havens, and the lesser or barred havens; but the distinction seems of little use, as they will deserve notice, rather on account of their being frequented, than on account of natural advantages. Those indeed which are most capacious, on the S. and S.W. have hitherto been little frequented, except by the smuggler, or by vessels unable to reach their destined port. Waterford and Cork harbours on the S.; Bantry and Dingle bays on the S.W.; the estuary of the Shannon, and the vast bay of Galway on the W.; that great opening on the N.W. of which the bay of Sligo is a part; Lough Swilly and Lough Foyle on the N., are the most considerable. On the eastern side, there are none possessed of great natural advantages, yet from the greater improvement of the adjoining country and the vicinity of England, there are many which are much frequented, especially the harbours of Belfast and Newry, and the barred havens of Dublin, Drogheda, and Wexford. The principal commercial towns are Dublin, Cork, Belfast, Limerick, and Waterford.

With respect to the climate of Ireland, strangers soon perceive that it is in general less hot in summer, and less cold in winter than in England, and other countries in the same latitude; and that very hot or very cold weather, when it does take place, continues for a much shorter time. If, however, the climate be more temperate, it is also much damper, both on account of a greater fall of rain, and of a moisture in the atmosphere when there is no rain, which produces a very striking effect on the walls of houses, on furniture, and various other articles. This prevalence of moisture seems to be occasioned by the winds blowing from the vast Atlantic ocean, and is more perceivable in the western and southern parts. Though the frequent showers answer very well for pasturage, and clothe the limestone rocks with verdure, yet they often interfere with the gathering in of the harvest, and render expedition on the part of the farmer, in using fine weather whilst in his power, more necessary. This short continuance of heat is not sufficient to ripen peaches, grapes, and other fruits, without great care and attention; but the broad-leaved myrtle (*Myrtus communis*) grows luxuriantly, with very little care, in the southern counties, being seldom injured by the cold of winter; and the arbutus (*Arbutus unedo*) is not found as a native in any other country so far distant from the equator. Persons advanced in life complain of an unfavourable change in the climate, saying that it is much severer and more uncertain than it used to be; and an ingenious writer, Dr. W. Hamilton, (in the 6th vol. of Transactions of the Royal Irish Academy), has stated some facts which appear to add credibility to such complaints. The pine-tree, especially that species called the Scotch fir, formerly grew on many

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of the mountains of this island, and on parts of the northern and western coasts exceedingly bare and open to storms. Vast roots and noble trunks of this species of pine have been seen, and examined with attention, in situations where human industry cannot now rear a twig of the hardiest tree. The devastation occasioned by sands in some parts of the northern coast, and even in the south, and the greater influxes of the tide, seem to prove the more frequent recurrence and greater violence of the Atlantic storms. The destruction of the forests may perhaps account satisfactorily for some of these facts, whilst others may have been occasioned by circumstances not yet sufficiently attended to. Dr. Paterfon, in his "Observations on the Climate of Ireland," has adduced many facts to controvert the opinion of a change; and the observations made a century and a half ago, are so applicable to the country at present, that it may be inferred the present seasons do not materially differ from former ones, and that the influence of the Atlantic has always been much the same. The winds most prevalent in Ireland are the west and south-west, which, contrary to the poetical description of zephyrs, are frequently attended with rain and storms. Easterly winds are less common, and are generally dry and keen; these are found prejudicial to health, and invalids avoid being exposed to them. On the whole, if the climate of Ireland be not the most agreeable, it is found very wholesome; instances of longevity are frequent, and if peculiar circumstances occasion much sickness in many of the large towns, the peasantry are very healthful, and, in consequence of it, robust and hardy. The bogs, which some have supposed to be unwholesome, are of a very different nature from the morasses in other countries, which appears both from the timber preserved in them, and from the effect produced on the skins of animals unfortunately lost in them.

The productions of Ireland, and the animals found in it, do not differ much from those in England. The most valuable ones in both seem to have been imported from other countries, and the variety of these must be greater in England, on account of its superior cultivation. The domestic animals are the same, and from the care taken of late years to improve the breeds, it may be expected that our sheep and oxen will not be surpassed. Bede, who has commemorated the praise of Ireland for abundance of honey and milk, also mentions numerous herds of deer, which animal the progress of cultivation has now rendered rare. In various parts of Ireland are dug up enormous horns of deer, which some writers have imagined to be of the species called moose deer in America; but Mr. Pennant has demonstrated that the animal must have almost doubled in size the American monster, which is sometimes found seventeen hands in height. The Irish horns have been found of the extent of fourteen feet from tip to tip, furnished with brow antlers, and weighing 300 pounds; the whole skeleton is frequently found with them. It is supposed that the animal must have been about twelve feet high. Wolves infested the country formerly, but are said to have been extirpated by Oliver Cromwell. It has been asserted that no poisonous animal will live in Ireland, and even that no spiders will haunt Irish timber, which, as is said, was the cause why it was often employed in magnificent ceilings in the middle ages. "Whether it be owing to the soil or the climate," says Dr. Beaufort, "certain it is that in Ireland there are neither moles nor toads, nor any kind of serpents; and it is not a hundred years since frogs, of which there are now abundance, were first imported from England. But though the same experiment has been made with snakes and vipers, it has happily been unsuccessful." The rivers, lakes, and seas

are stocked with a great variety of fish, which yield a plentiful article of food to all ranks of people. The fisheries on the coast give employment to great numbers, and have become, in some instances, an object of national attention and legislative encouragement, though they have never yet been carried on as extensively as they might be, or there could have been no occasion for an importation of fish from foreign countries. Jephson Oddy, esq. in his prospectus of a western fishery company, mentions that the Nymph bank, and others near the coast of Ireland, abound with the finest cod, ling, hake, turbot, pollock, &c., and that the adjoining seas are frequented at different periods by mackerel and herrings in great quantities; and he forcibly urges that if this fishery was carried on with spirit, it would supply both England and Ireland with abundance of fish, so as to render importation unnecessary, whilst it would at the same time give employment to numbers, and prove a valuable nursery for seamen.

The native grasses are those esteemed most valuable by the farmer, so that Ireland has ever been celebrated for the excellence of its pastures; the number of cultivated vegetables is daily increasing; and in consequence of the attention lately paid to botanical knowledge, it appears that native plants have not been bestowed with a sparing hand. The introduction of the potatoe, the value of which is universally acknowledged, and which forms the principal part of the food of the Irish peasantry, has been commonly attributed to sir Walter Raleigh.

To this general and brief account of the natural state of Ireland, it may be proper to subjoin a list of the counties into which Ireland is divided. The population of each, as stated by Dr. Beaufort, is added; at the same time it must be observed, that this most probably falls far short of the real population, as in so many years as have elapsed since its publication, there must have been a considerable increase. It may serve, however, to give some idea of the comparative population of different counties, until more satisfactory documents than at present exist enable us to give a more correct statement. The number of counties is 32, which are contained in four provinces. A particular account of each will be found under their respective names.

ULSTER.

County.	Shire Town.	Population.
Antrim	Carrikerfergus	166,000
Down	Downpatrick	201,500
Armagh	Armagh	120,000
Tyrone	Omagh	158,000
Londonderry	Londonderry	125,000
Donegal	Lifford	140,000
Fermanagh	Enniskillen	71,800
Cavan	Cavan	11,570
Monaghan	Monaghan	118,000

LEINSTER.

Louth	Dundalk	57,750
Meath	Trim	112,400
Westmeath	Mullingar	69,000
Longford	Longford	50,100
King's county	Philipstown	74,500
Queen's county	Maryborough	82,000
Kildare	Naas	56,000
Dublin	Dublin	198,000
Wicklow	Wicklow	58,000
Wexford	Wexford	115,000
Carlow	Carlow	44,000
Kilkenny	Kilkenny	100,000

CONNAUGHT.

IRELAND.

CONNAUGHT.

Sligo	Sligo	60,000
Leitrim	Carrick on Shannon	50,000
Roscommon	Roscommon	86,000
Mayo	Castlebar	140,000
Galway	Galway	142,000

MUNSTER.

Clare	Ennis	96,000
Limerick	Limerick	170,000
Kerry	Tralee	107,000
Cork	Cork	416,000
Tipperary	Clonmell	169,000
Waterford	Waterford	110,000

Mr. Pinkerton is of opinion that Ireland was early discovered by the Phœnicians. "On the first dawn of history," says he, "and when the north-west of Europe was as obscure to the Greeks, as the islands on the north-east of Siberia were recently to us, it would seem that Ireland constituted one of the Cassiterides. The poems ascribed to Orpheus deserve no credit, but it appears that the island was known to the Greeks by the name of *Juveona*, about two centuries before the birth of Christ. When Cæsar made his expedition into Britain, he describes *Hibernia* as being about half the size of the island which he had explored; and while the Romans maintained their conquests in the latter region, Ireland continued, of course, to be well known to them, and Ptolemy has given a map of the island, which is superior, in accuracy, to that which represents Scotland. Towards the decline of the western empire, as the country had become more and more known, and had been peopled with various tribes, the Romans discovered that the ruling people in Ireland were the *Scoti*; and thenceforth the country began to be called *Scotia*, an appellation retained by the monastic writers till the eleventh century, when the name *Scotia* having passed to modern Scotland, the ancient name of *Hibernia* began to re-assume its honours. It is supposed that this name, and the Gothic denomination *Ireland*, are mere modifications of the native term *Érin*, implying the country of the west."

"It is probable," says the same writer, whose attention to the subject of antiquities gives great weight to his opinion, "that the original population of Ireland passed from Gaul, and was afterwards increased by their brethren the *Guydl* from England. About the time that the Belgæ seized on the south of England, it appears that kindred Gothic tribes passed to the south of Ireland. These are the *Firbolg* of the Irish traditions; and appear to have been the same people whom the Romans denominated *Scoti*, after they had emerged to their notice by not only extending their conquests to the north and east in Ireland, but had begun to make maritime excursions against the Roman provinces in Britain. But Ireland had been so much crowded with Celtic tribes, expelled from the continent and Britain by the progress of the German Goths, that the Belgæ almost lost their native speech and distinct character; and from intermarriage, &c. became little distinguishable from the original population, except by superior ferocity, for which the *Scoti*, or those who affected a descent from the Gothic colonies, were remarkable; while the original Gael seem to have been an innoxious people." Such is Mr. Pinkerton's account of the early state of Ireland, but as very different ones have been given respecting this, and as it still continues to be a subject of controversy, it will be proper to give a brief abstract of the principal opinions, and the authority on which

they rest. The celebrated Edmund Spenser, in his "View of the State of Ireland," supposes it to have been first peopled by the Scythians, from whom the name *Scotia* was derived. These settled in Ulster, and a colony from them went to Scotland. Another nation came out of Spain to the west part of Ireland, and finding it waste, or weakly inhabited, possessed it. These he supposed to have been Gauls, who had learned letters in Spain, where they were introduced by the Phœnicians, and brought them to Ireland, where it is certain they were known at a very early period. From the Scythians, Spenser supposes the Irish to have derived, 1st, the custom of keeping their cattle, and living themselves, for the most part of the year, in *boodies* or hordes, pasturing upon the mountains and waste wild places; and removing still to fresh land, as they had depastured the former. This custom, which seems to have continued to Spenser's time, was very injurious. The *boodies* were receptacles for outlaws and loose people, who there evaded justice; and those who lived in them grew more barbarous, and lived more licentious than they could in towns, using what manners they listed, and practising what mischiefs and villanies they would either against the government, or private individuals. Another Scythian custom was the wearing of mantles, and long glibbes, which is a thick curled bush of hair, hanging down over their eyes, and monstrously disfiguring them. These mantles Spenser describes as convenient for outlaws, rebels, and thieves. As the passage is curious, and the work less known than it ought to be, the insertion of it may afford some entertainment to the reader. "First the outlaw being for his many crimes and villanies banished from the townes and houses of honest men, and wandering in waste places, far from danger of law, maketh his mantle his house, and under it covereth himselfe from the wrath of heaven, from the offence of the earth, and from the sight of men. When it raineth, it is his pent-house; when it bloweth, it is his tent; when it freezeth, it is his tabernacle. In sommer he can wear it loose; in winter he can wrap it close; at all times he can use it; never heavy, never cumbersome. Likewise for a rebell it is as serviceable. For in his warre that he maketh (if at least it deserve the name of warre) when he still flyeth from his foe, and lurketh in the thick woods and strait passages, waiting for advantages, it is his bed, yea, and almost his household stuff. For the wood is his house against all weathers, and his mantle is his couch to sleep in. Therein he wrappeth himselfe round, and coucheth himselfe strongly against the gnats, which in that country doe more annoy the naked rebels, whilst they keepe the woods, and doe more sharply wound them than all their enemies swords, or spears, which can seldom come nigh them; yea, and oftentimes their mantle serveth them, when they are neare driven, being wrapped about their left arme, instead of a target, for it is hard to cut thorough with a sword, besides it is light to beare, light to throw away, and being (as they commonly are) naked, it is to them all in all. Lastly, for a thiefe it is so handsome, as it may seeme it was first invented for him, for under it he may cleanly convey any fit pillage that commeth handfomly in his way, and when he goeth abroad in the night in free-booting, it is his best and surest friend; for lying, as they often doe, two or three nights together abroad to watch for their booty, with that they can prettily shroud themselves under a bush, or a bank side, till they may conveniently doe their errand; and when all is over, he can, in his mantle, passe thorough any town or company, being close hooded over his head, as he useth, from knowledge of any to whom he is endangered. Besides this, he, or any man els that is disposed to mischiefe or villany, may under his mantle goe privily armed without

suspicion of any, carry his head-peece, his skean or pistol if he please, to be always in readiness." In like manner he considers the long hair or glibbe as serving the purpose of concealment. The Irish cry, or *hubub* as he calls it, which the kerne or soldiery use at their first encounter, he also considers of Scythian origin; and also the calling upon the name of some chieftain, as *Ferragh* for instance, which he supposes to be the name of a chief under whom they fought successfully against the Africans. To this he adds their lamentations at their burials, "with dispairful out-cries and immoderate waylings," which favour greatly of the Scythian barbarism. Our ingenious author next proceeds to shew that the Irish arms and weapons are Scythian, and the same also as those used by the old Scots, who were of the same stock; that the Irish resembled the Scythians in their confused kind of march without order or array; and also in certain religious ceremonies. From all these circumstances he infers that the Irish are anciently deduced from the Scythians. He afterwards adduces customs derived from the Spaniards and Gauls in proof of colonies of them having been established in Ireland, but they are fewer in number and less remarkable. The use of saffron shirts, the giving the charge of all household affairs at home and abroad to their women, the manner in which these sat on horse-back, with a few others, are stated as of Spanish origin; whilst the use of long darts and wicker shields is mentioned as derived from the Gauls. Such is Spenfer's opinion respecting the origin of the Irish, founded, as may be seen, on conjectures, for the inferences drawn from customs can scarcely deserve any other name. The colony from Spain, which he admits, though he speaks doubtfully of the origin of the people, and gives no particulars, is laid great stress on by the advocates for the ancient glory of Ireland. "Not to speak of the original settlement by Partholan," says Dr. Leland, "it is maintained that about 500 years before the Christian era, a colony of Scythians, immediately from Spain, settled in Ireland, and introduced the Phœnician language and letters into this country; and that however it might have been peopled still earlier, yet Heber, Heremon, and Ith, the sons of Milech, gave a race of kings to the Irish, distinguished from their days by the names of Gadelians and Scuits or Scots. Hence their writers trace a gradual refinement of their country from a state of barbarous feuds, factions, and competitions; until the monarch, celebrated in their annals by the name of Ollam-Fodla, established a regular form of government, erected a grand seminary of learning, and instituted the *Fes*, or triennial convention of provincial kings, priests, and poets, at Teamor or Tarch, in Meath, for the establishment of laws and regulation of government. Keating, the Irish historian, who transcribed his accounts from poetical records, mentions little more of this boasted assembly, than that its great object was to introduce civility, and to guard against those crimes which predominate in days of rudeness and violence. The magnificent detail of its grandeur and solemnity, the scrupulous attention paid by its members to the national history, annals, and genealogies, are nothing more (as I am assured) than the interpolations of an ignorant and presumptuous translator. But whatever were the institutions of this monarch, it is acknowledged that they soon proved too weak for the wildness and disorder of the time. To Kimbath, one of his successors, the annalists give the honour of reviving them; besides that of regulating Ullster, his family province, and adorning it by the stately palace of Eamania, erected near Armagh." One of his successors, to secure his power, divided the island into twenty-five dynasties, instead of five; but the pentarchal government was restored about a century

before the Christian era. Anarchy, sedition, and murder continued prevalent, notwithstanding the wise laws occasionally enacted; and an Irish chieftain is said to have addressed himself to Agricola, and to have encouraged him to make a descent on Ireland. Those, however, who warmly contend for the honour of Ireland, say that such descent would not have been effectual; and record with triumph that the Irish monarch of this time, instead of dreading an invasion of the Romans, failed to the assistance of the Picts, led an irruption into the Roman province, and returned in triumph laden with foreign spoils. After this, the old Firbolgs or Belgic inhabitants grew so powerful and turbulent as to establish a monarch of their own race, and to harass the country by what was called the Attacotic war. Tuathel, a Milesian prince, restored the power of his family; and in the time of his grandson, in the third century, Finn, the son of Comhal, better known by the name of Fingal, is said to have lived, and to have been general of his troops. The succession of kings of the Milesian family, to the year 1198, is said to have been 171.

General Vallancey, who has paid very great attention to the antiquities of Ireland, and whose great learning and personal respectability, as well as his exertions for the good of society, should secure him from petulant and wanton abuse, has, in his "Vindication of the ancient History of Ireland," maintained the truth of the leading facts mentioned by Keating and others. The Scythians, by whom the country was peopled, were, according to him, not the Northern, but Southern Scythians, the same people as the Phœnicians, who are to be distinguished from the Canaanites, and were the navigators of the latter, acknowledged as subjects, but never admitted to a share in the government, or to the rank of noblesse. They had the use of letters, a knowledge of astronomy, of marine astronomy in particular, and of navigation; but had no knowledge of the fine arts, their religion forbidding it. These Phœnicians are supposed to have been originally Persians or Indians, proceeding from that eastern district, the supposed source of all civilization; and the late writers on Indian antiquities produce many circumstances tending to establish a knowledge of Ireland in that oriental people, and an intercourse with it at a very early period. It would occupy more room than the nature of a Cyclopædia would allow, to enter upon the arguments adduced by the learned general in support of his opinions. Suffice it to say, that they chiefly rest on the etymology of names, on a resemblance in certain words, and on a resemblance also in certain religious ceremonies and old customs, which are thought to have originated in fire-worship, which is supposed to have been once prevalent throughout Ireland. The Rev. Dr. Ledwich, author of an elaborate work on the "Antiquities of Ireland," endeavours, with all the eagerness of a partizan, to expose and ridicule all pretensions to early civilization. He contends that Ireland was first peopled from Great Britain by the Celts, who were wandering savages, of whom little is recorded, and that little proclaims their ignorance and barbarism. The Belgæ and other northern tribes afterwards settled in it; and it had at no time arrived to a greater degree of improvement than when visited by the English under Henry II. To be qualified to form an opinion on the preceding subject would require a long course of study, the acquisition of languages of little use except to the antiquary, and the perusal of many volumes in the highest degree dry and uninteresting; and after all, such is the want of written documents of an early date, that the most we could arrive at would be probable conjecture. At the same time, it does not appear improbable, much less absurd to suppose, that the Phœnicians

cians might have colonized Ireland at an early period, and introduced their laws, customs, and knowledge, with a comparatively high state of civilization; and that these might have been gradually lost amidst the disturbances of the country, and at last completely destroyed by the irruptions of the Ostmen, so as to have reduced Ireland to a barbarous state, previous to the English invasion.

The conversion of Ireland to Christianity is generally attributed to Patrick, who has been called the "tutelar saint of Ireland." He is said to have landed in Ireland A.D. 430. The people were, however, prepared for his preaching by the labours of some former missionaries. Notwithstanding the introduction of Christianity, the petty princes and people retained their ferocity of manners; and the annals abound in horrid instances of revenge, and hideous effects of avarice and ambition. "Yet Christianity, as then taught," says Dr. Leland, "although it could not eradicate, at least restrained the national vices. A numerous body of ecclesiastics, secular and regular, quickly swarmed over the whole country; frequently became umpires between contending chieftains; and when they could not confine them within the bounds of reason and religion, at least terrified them by denouncing vengeance against their excesses. An ignorant people listened to their tales of pretended miracles with a religious horror. In the midst of every provincial contest, and every domestic strife, they were sacred and inviolate. They soon learned to derive their own emolument from the public veneration. The infant church was every where amply endowed, and the prayers of holy men repaid by large donations. Some of the oldest remains of Irish literature, as they have been explained to me, inform us, that the people were taught to dedicate the first-born of all cattle to the church, as a matter of indispensable obligation. But if the clergy thus acquired riches, they applied them to the noblest purposes. The monks, says Mr. O'Connor, fixed their habitations in deserts, which they cultivated with their own hands, and rendered the most delightful spots in the kingdom. These deserts became cities; and it is remarkable enough, that to the monks we owe so useful an institution in Ireland, as bringing great numbers together into one civil community. In these cities the monks set up schools, in which they educated the youth, not only of the island, but of the neighbouring nations. The testimony of Bede is unquestionable, that about the middle of the seventh century, in the days of the venerable prelates Finian and Colman, many nobles and other orders of the Anglo-Saxons retired from their own country into Ireland, either for instruction, or for an opportunity of living in monasteries of stricter discipline; and that the Scots (as he styles the Irish) maintained them, taught them, and furnished them with books, without fee or reward:—a most honourable testimony, says the elegant lord Lyttelton, not only to the learning, but likewise to the hospitality and bounty of that nation! A conflux of foreigners to a retired island, at a time when Europe was in ignorance and confusion, gave peculiar lustre to this feat of learning: nor is it improbable or surprising that seven thousand students studied at Armagh, agreeably to the accounts of Irish writers; though the seminary of Armagh was but one of those numerous colleges erected in Ireland. But the labours of the Irish clergy were not confined to their own country. Their missionaries were sent to the continent. They converted heathens; they confirmed believers; they erected convents; they established schools of learning; they taught the use of letters to the Saxons and Normans; they converted the Picts, by the preaching of Columbkille, one of their renowned ecclesiastics. Burgundy, Germany, and other countries received

their instructions: and Europe with gratitude confessed the superior knowledge, the piety, the zeal, the purity of the "Island of Saints." Such are the events on which Irish writers dwell with an enthusiastic delight. The first Christian missionaries seem to have industriously avoided all unnecessary violence to the ancient manners of the Irish. Their poets they favoured and protected; the remains of the Druidical order were not persecuted; and although divine vengeance was thundered against the worshippers of the sun, stars, and winds, it is evident that some Pagan superstitions were overlooked with too great indulgence, for they subsist at this day in Ireland: fires are lighted up at particular times, and the more ignorant Irish still drive their cattle through those fires, as an effectual means of preserving them from future accidents." Such is the abstract given by Leland, in his preliminary discourse of the introduction and establishment of Christianity. Dr. Ledwich, however, not only gives a different account of these, but even calls in question the existence of St. Patrick, regarding him as an ideal personage. He supposes, and with great appearance of reason, that Christianity, which had been brought to Gaul by Pothinus and Irenæus, disciples of Polycarp, who had been himself instructed by John the Evangelist, from Gaul reached Britain, and from Britain was carried to Ireland, in the third or fourth century, as early as the supposed time of St. Patrick, or even earlier. It seems a strong circumstance in favour of this opinion, that the Irish Christians, or the Saxons converted by them, did not acknowledge the Roman pontiff till long after the rest of the Christian world; which would not have been the case, had their instruction proceeded from one sent immediately from Rome to convert them, as Patrick is said to have been. If such a person as Patrick really preached Christianity in Ireland, it seems at least to be certain that not only the miracles assigned to him are monkish inventions, but that his episcopal dignity, and many other circumstances recorded, are without foundation. Columba appears to have been the founder of the Irish monasteries; and, like the Scotch, the Culdee sect was prevalent amongst them, and was not completely overthrown until pope Adrian, in the plenitude of his presumption, bestowed Ireland on Henry II. in 1155. See CULDEES.

Ireland was divided into five separate kingdoms, and in each of these were powerful and factious dynasties. All indeed acknowledged one monarch, but his power was remarkably weakened; and if the people were not wretched, it was because the evils of their political constitution were in some measure corrected by the reverence paid to religion and learning. As the armies collected by such governments are temporary, they are ill calculated for resisting a foreign invasion; and such was found to be the case in Ireland. Bede mentions, that, in 684, the general of Egfrid, king of Northumberland, made a descent on Ireland. But instead of mentioning any gallant resistance made by the natives, he insinuates that they trusted more to prayers than arms; and in the plaintive style of compassion laments the miserable havoc of a people, inoffensive, and ever most friendly to the English. But Ireland experienced a still more formidable invasion, when the Danes, Norwegians, and other Scandinavian adventurers began to rove in search of new settlements. These were called Normans, Esterlings, or Ostmen, and also Galls or foreigners. Their piratical expeditions commenced about the end of the eighth century, and whilst they infested England and France, Ireland did not escape. Their first invasions were made in small parties for the sake of plunder, and were frequently repulsed. By degrees the invaders, either by force or treaty, obtained

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obtained some small settlements; and at length Turgeſius, a warlike Norwegian, in 815, landed with a powerful armament, and committed every kind of outrage. Having reduced the inhabitants to ſlavery, after a reſidence of 30 years, he was proclaimed monarch of the kingdom; but at length Melachlin, prince of Meath, contrived to ſeize upon the tyrant in a time of apparent peace, and the Danes, ſurprized by a ſudden inſurrection, were maſſacred or diſperſed. A new colony, however, arrived, and were allowed to ſettle in ſome maritime towns. Theſe gradually ſtrengthened themſelves, and maintained their independence, though frequently engaged in wars with the Iriſh princes, and repeatedly overcome in battle. The moſt celebrated of theſe engagements was at Clontarf, near Dublin, in 1012, when the Iriſh were ſucceſſful, but loſt their monarch, Brian Boiromhe, at the age of 88, and his ſon Morehard. After this event Ireland continued to be diſtracted by civil wars, and the ſituation of the people was as wretched as can almoſt be conceived; ſo that the iſland was rendered an eaſy prey to any daring invader.

It has been already noticed that the clergy of Ireland were of the Culdee ſect, by which the Roman pontiff was not acknowledged. This is indeed matter of controverſy; but it ſeems indubitable that they were very irregular, and that it was an object with the pope to bring them to obedience. The pontificate, however, by the intereſted zeal of its numerous and active emiſſaries, at length contrived to extend its influence even to this remote iſland, alarmed the Iriſh clergy with fears of the irregularity of their eccleſiaſtical conſtitution, and perſuaded them to ſubmit to a reform, modelled and dictated by Rome. Cardinal Papire, or Papeſon, came to Ireland as legate in 1148; and in 1151, or 1152, ſummoned a council, which was attended by about 3000 eccleſiaſtics, and four palli were ſolemnly received from the pope by the prelates of Armagh, Dublin, Caſhel, and Tuam. At the ſame time, it is ſaid that the celebration of Eaſter was adjusted according to the Romiſh deciſions, the celibacy of the clergy was enforced, and the pre-eminence of Rome formally acknowledged. Whether Adrian, at that time pope, did not think this ſubmiſſion of the Iriſh clergy ſufficiently eſtabliſhed, or, as an Engliſhman, was willing to gratify the Engliſh monarch, though at the expence of his newly-acquired dependents, he iſſued a bull in 1155 conformable to the wiſhes and purpoſes of Henry, who, at the very commencement of his reign, meditated the ſubjugation of Ireland, and ſent his chaplain to ſolicit the pope's countenance. For ſuch an invasion no juſt pretence could be aſſigned. Ireland was entirely independent; and, though aſſiſtance had been afforded in a former reign to the ſons of Harold, yet there had been for many years nothing which could be reckoned hoſtile. It was aſſerted, indeed, that Engliſhmen had been ſold as ſlaves in Ireland; but this was a crime in which both nations were equally involved, and which, therefore, could not be urged to juſtify ſuch an attempt. The depravity and barbariſm of the Iriſh were, however, ſiſtled on; the honour of God was to be promoted by their ſubjugation; and the pope was to receive the tribute of St. Peter's pence as the reward of his compliance. A bull was accordingly iſſued, which, as Leland obſerves, affords a ſhocking inſtance of the proſtitution and impiety of papal uſurpation. Much has been ſaid of the depraved ſtate of the Iriſh at this period; but the accounts proceed from a very ſuſpicious ſource, thoſe whoſe object it was to defend the proceedings of the Engliſh monarch; and it may be queſtioned whether they were really worſe than their neighbours, or ſo bad as thoſe who have thus ſigmatized them. But whatever their moral defects might be, their

political ones were very great; they were truly a divided people. A monarch, little more than titular, depending on his own abilities and vigour for power and influence, was haraſſed by faction, and oppoſed by powerful rivals; whiſt a number of provincial chieftains, who aſſumed the title and the rights of royalty, paid a precarious tribute to their ſuperior, and united, if they were diſpoſed to unite with him, as allies rather than ſubjects. This was in a great degree the ſtate of France and ſome other countries; but in Ireland the monarchial dignity was not hereditary, and was the ſubject of frequent diſpute. Favourable as ſuch a ſtate was to the wiſhes of Henry, yet it was long before he could avail himſelf of the bull he had received. In France and England he found full employment for many years; and ſcarcely had he ſecured his dominions before he was involved in that conteſt with Becket, which kept him in a continual ſtate of agitation. The circumſtance which led to the accompliſhment of his deſign, was the expulſion of Dermot, king of Leinſter, from his dominions, and that prince's taking refuge in England. Dermot, a man of a turbulent and oppreſſive ſpirit, had, by his conduct, provoked the vengeance of Roderic O'Connor, the monarch of Ireland, whiſt his own immediate dependants deſerted him in the hour of his diſtreſs. He applied to Henry for aſſiſtance to recover his dominions; but, whether from the perplexity of his own affairs, or, as ſir John Davies ſuppoſes, a wiſh to avoid the expence, this monarch did not undertake the cauſe, but gave licence, by his letters patent, that ſuch of his ſubjects might paſs over into Ireland as would at their own charge become adventurers in that enterpriſe. Notwithſtanding this permiſſion, he did not for ſome months ſucceed in obtaining ſuccour; but at length he prevailed on Richard, earl of Pembroke, generally called Strongbow, to eſpouſe his cauſe, promiſing him his daughter Eva in marriage, and with her the inheritance of his kingdom. And on his return to Ireland, to prepare for Strongbow's arrival, he engaged two Welſh leaders, Fitzſtephen and Fitzgerald, with their followers, on the condition of ceding to them the town of Wexford, with a large adjoining territory, as ſoon, as by their aſſiſtance, he could be re-inſtated in his rights. The invasion of Ireland was therefore the act of private adventurers. Fitzſtephen and Fitzgerald firſt broke the ice with a party of 390 men in 1170. The earl Strongbow followed them with 1200 more; and their good ſucceſs on the ſea coaſts of Leinſter and Munſter drew over the king in perſon, who landed at Waterford in 1172, with 500 knights and about 4000 ſoldiers. Strongbow immediately ſurrendered to him the city of Waterford, and did homage to him for the principality of Leinſter, which he claimed in right of his wife, the daughter of Dermot, whoſe death had taken place in the preceding year. The neighbouring Iriſh princes in like manner ſubmitted, and acknowledged his authority; and even Roderic, after ſome delay, thought it more prudent to follow their example. Henry aſſumed the title of lord of Ireland, but his authority was very weak; and, within five months after his arrival, he departed out of Ireland without ſtriking one blow, or building one caſtle, or planting one gariſon among the Iriſh. Such was the conqueſt of Ireland by Henry II; which, as it was unjuſtifiable, ſo was it inefficient. As ſir John Davis obſerves, "though king Henry II. had the title of ſovereign and lord over the Iriſh, yet did he not put thoſe things in execution which are the true marks of ſovereignty. For, to give laws unto a people; to inſtitute magiſtrates and officers over them; to puniſh and pardon malefactors; to have the ſole authority of making war and peace, and the like, are true marks of ſovereignty, which king Henry II. had not in the Iriſh countries; but the Iriſh lords did ſtill retain all theſe

these prerogatives to themselves: for they governed their people by the Brehon law; they made their own magistrates and officers; they pardoned and punished all malefactors within their several countries; they made war and peace one with another without controlment; and this they did, not only during the reign of Henry II. but afterwards, in all times, even until the reign of queen Elizabeth." In fact, the Irish only acknowledged the superiority of Henry in the same way as the Welsh princes often did before their subjection; and in the same way as Henry himself did homage to the king of France, as his liege lord for the vast territories he held in France. Henry himself, in the treaty of agreement made in 1175, acknowledged Roderic as king of Connaught, and in his commission to William Fitz-Adeline gave the Irish lords the title and style of kings. It is unnecessary to enter into a detail of the petty wars between the English settlers and Irish chieftains, or of the jealousy entertained of the former by their sovereigns, who, though prevented by family distresses from going over, sent agents to watch and check them. Had Ireland been at this time subdued by a competent force, and the English laws introduced into every part of it, it would have contributed to the quiet and happiness of all classes; but as it was, the English settlers added to the confusion. Their only object appears to have been to acquire territories for themselves; and few crossed to Ireland except rude and barbarous warriors, little, if at all, superior to those amongst whom they went. In 1185, Henry sent John, his youngest son, whom he had previously made lord of Ireland, to that country. This young prince, being but 12 years of age, with a train of young noblemen and gentlemen to the number of 300, but not with any considerable army, arrived at Waterford, and was attended there by the Irish chieftains, who, disunited among themselves, and terrified by the representations of his force, flocked to Waterford to pay their respects and do homage. But the youthful courtiers about the prince were not calculated to conciliate; they treated their visitors with the utmost scorn and contempt, and so highly roused their indignation as to produce a general spirit of resistance. The original settlers, too, were ill used, and the English interest was with great difficulty maintained in the towns which they had fortified. Henry found it necessary to recal his son, and the government of Ireland was committed to John de Courcy, a valiant knight, who had already acquired considerable possessions in Ulster. "From this time forward," says that judicious writer sir John Davies, "until the 12th year of king John, (which was a space of more than 30 years,) there was no army transmitted out of England to finish the conquest. Howbeit, in the mean time, the English adventurers and colonies already planted in Ireland did win much ground upon the Irish; namely, the earl Strongbow, having married the daughter of Mac Morrogh in Leinster; the Lucies in Meath; the Geraldians and other adventurers in Munster; the Aúdelies, Gernons, Clintons, Ruffels, and other volunteers of sir John de Courcy's retinue in Ulster; and the Bourkes (planted by William Fitz-Adeline) in Connaught. Yet were the English reputed but part owners of Ireland at this time, as appears by the commission of the pope's legate in the time of king Richard I., whereby he had power to exercise his jurisdiction in England, Wales, and *those parts of Ireland* in which John earl of Morton has power and dominion, as it is recorded by Matthew Paris." During this interval, not only the Irish chieftains frequently revolted, but some of the great English settlers assumed independence. This was particularly the case after the accession of John to the English throne, and the suppression of one of these was the avowed object of his visit to Ireland in

the year 1210. He brought with him a considerable force, though not perhaps sufficient for the complete reduction of the island, even if he had remained a sufficient time to perform so great an action. This, however, he did not, for he arrived in June and returned in September the same year. The Irish lords, for the most part, submitted themselves to him, as they had done before to his father; "which," says sir John Davies, "was but a mere mockery and imposture: for his back was no sooner turned, but they returned to their former rebellion: and yet this was reputed a second conquest." At this time twelve counties were established in Leinster and Munster, and sheriffs appointed for them, and courts of judicature were also settled in Dublin, for the regular and effectual execution of the laws of England in that part of the island which acknowledged allegiance to the crown. Some castles were built upon the borders of the English colonies, but the king carrying back with him the army he had brought, the former settlers were left to defend their possessions, and increase them in the best manner they were able.

The long and turbulent reign of Henry III. was distinguished by no remarkable change in the state of Ireland. The families of Burgh and Fitzgerald received a large accession of power and territory, and the clergy, though themselves oppressed both by the king and the pope, were not deficient in turbulence and presumption. Edward I. an active monarch, was too much engaged in regulating the disordered state of England, and in reducing Wales and Scotland, to devote much attention to the affairs of Ireland. At the commencement of his reign, the English settlers experienced some heavy losses, and were nearly expelled from their southern possessions, but the Irish were not united, and the advantages gained in one year were often lost the next, through the dissensions of the conquerors. Many of the Irish were at this time anxious to share the protection of the English laws, for, to the disgrace of the English government, this advantage had been withheld, and whilst the murder of an Englishman by one of the *mere Irish*, as they were termed, was avenged with the utmost rigour, the murder of an Irishman was scarcely deemed a punishable offence. An application was made early in this reign to Ufford, the chief governor, offering the king 8000 marks, provided he would grant the free enjoyment of the laws of England to the Irish inhabitants. The petitioners must have been the Irish residing within what was called the "English pale," for the rest were so much attached to their own Brehon laws, as to be adverse to a change at a much later period; though it is probable that if the wise policy of assimilating *all* the inhabitants had been now adopted, the objection to it would have been less, than at the time it was actually attempted. The king was well inclined to comply with the request of the petitioners, but this did not suit those, whose violence and oppression would have been thus controlled, and whose influence was great enough to counteract the intended measure. Individuals, however, of the Irish race sued for, and obtained charters of denization, particularly on their intermarriage with the English. That such conduct irritated the old inhabitants cannot be surprising. "As long as they (the Irish) were out of the protection of the law," says sir John Davies, "so as every Englishman might oppress, spoil, and kill them without controulment, how was it possible they should be other than outlaws, and enemies to the crown of England? If the king would not admit them to the condition of subjects, how could they learn to acknowledge and obey him as their sovereign? When they might not converse or commerce with any civil men, nor enter into any town or city without peril

of their lives, whither should they fly but into the woods and mountains, and there live in a wild and barbarous manner? If the English magistrates would not rule them by the law which doth punish murder, and treason, and theft with death, but leave them to be ruled by their own lords and laws, why should they not embrace their own Brehon law, which punishes no offence, but with a fine or ericke? If the Irish be not permitted to purchase estates of freeholds or inheritance, which might descend to their children, according to the course of our common law, must they not continue their custom of tanistry, which makes all their possessions uncertain, and brings confusion, barbarism, and incivility? In a word, if the English would neither in peace govern them by the law, nor in war root them out by the sword, must they not needs be pricks in their eyes and thorns in their sides, till the world's end."

Sir John Wogan, appointed to the government in the year 1295, endeavoured to enforce the laws, and to keep in order the turbulent nobles of English extraction. For this purpose a parliament was summoned more regularly than such assemblies had hitherto been convened in Ireland. The regulations made by it, however, though calculated to check the disorders of the time, were either of little avail, or their effect of short duration; and the country still continued in a distracted state. The weak government of the second Edward left the great lords at full liberty to pursue their respective schemes of private interest, when an invasion by Edward, the brother of Robert Bruce, now established king of Scotland, supported by the chieftains of Ulster, reduced them to the greatest distress. Bruce was even crowned king of Ireland at Dundalk, and proceeded into Munster, carrying devastation wherever he went. His troops, however, wasted away by pestilence and famine, were reduced to a small number, and in a battle, which he too eagerly fought, he was slain the third year after his landing in Ireland. On his defeat, matters reverted to the old channel, and so continued through the succeeding reign, until the appointment of Lionel, the king's second son, to be chief governor in 1361. Before notice is taken of his proceedings, it will be necessary to observe, that in the reign of Edward II., Maurice Fitz-Thomas of Desmond, being chief commander against the Scots, began that extortion of coin and livery, which is called, in the old statutes, a *damnable custom*, and the imposing and taking of them declared high treason. These words imply that he and his army exacted food for themselves and their horses, and money at pleasure, without any ticket, or other satisfaction. And this was, after that time, the general fault of all the governors and commanders of the army in Ireland, though some were more cruel in the exaction than others. "Besides," says Davies, "the English colonies, being dispersed in every province of this kingdom, were enforced to keep continual guards upon the borders and marshes round about them; which guards, consisting of idle soldiers, were likewise imposed as a continual burden upon the poor English freeholders, whom they oppressed and impoverished in the same manner. And because the great English lords and captains had power to impose this charge, when and where they pleased, many of the poor freeholders were glad to give unto these lords a great part of their lands, to hold the rest free from that extortion; and many others, not being able to endure that intolerable oppression, did utterly quit their freeholds, and returned into England. By these means the English colonies grew poor and weak, though the English lords grew rich and mighty; for they placed Irish tenants upon the lands relinquished by the English; upon them they levied all Irish exactions; with them they married, and fostered, and made

gossips; so as within one age the English, both lords and freeholders, became degenerate and mere Irish in their language, in their apparel, in their arms and manner of fight, and all other customs of life whatsoever."

Lionel, soon after created duke of Clarence, was, in right of his wife, possessed of a considerable territory in Ireland, and his first object seems to have been to recover parts of it from those who were now called *rebels*. His military proceedings were of no great moment, but he applied himself with zeal and diligence to the reformation of the English settlers. A parliament was summoned at Kilkenny, which was more respectable and numerous than any preceding one, and the result of the deliberation of which was that ordinance, known by the name of the Statute of Kilkenny: this was in 1367. The great object of this statute was to reduce the English colonies to obedience of the English law and magistrates. "The preamble of it recites," (to use the abstract given of it by Dr. Leland,) "with a decision not without colour, but yet too general and indiscriminate, that the English of the realm of Ireland, before the arrival of the duke of Clarence, were become mere Irish in their language, names, apparel, and manner of living; had rejected the English laws, and submitted to those of the Irish, with whom they had united by marriage alliance to the ruin of the general weal. It was, therefore, enacted, that marriage, nurture of infants, and gossipized with the Irish, should be considered and punished as high treason. Again, if any man of English race shall use an Irish name, the Irish language, or the Irish apparel, or any mode or custom of the Irish, the act provides that he shall forfeit lands and tenements, until he hath given security in the court of chancery to conform in every particular to the English manners. The Brehon law was pronounced to be a pernicious custom and innovation lately introduced among the English subjects. It was, therefore, ordained, that in all their controversies they should be governed by the common law of England: and that whoever should submit to the Irish jurisdiction, was to be adjudged guilty of high treason. As the English had been accustomed to make war and peace with the bordering enemy at their pleasure, they were now expressly prohibited from levying war upon the Irish without special warrant from the state. It was also made highly penal to the English, to permit their Irish neighbours to graze their lands, to present them to ecclesiastical benefices, or to receive them into monasteries or religious houses; to entertain their bards, who perverted their imaginations by romantic tales; or their news-tellers, who seduced them by false reports. It was made felony to impose or cede any forces upon the English subject against his will. And as the royal liberties and franchises were become sanctuaries for malefactors, express power was given to the king's sheriffs to enter into all franchises, and there to apprehend felons and traitors. Lastly, because the great lords, when they levied forces for the public service, acted with partiality, and laid unequal burdens upon the subjects, it was ordained that four wardens of the peace in every county should adjudge what men and armour every lord and tenant should provide. The statute was promulgated with particular solemnity; and the spiritual lords, the better to enforce obedience, denounced an excommunication on those who should presume to violate it in any instance." After observing that these institutions did not apply to any except the English settlers, Dr. Leland goes on to remark upon the want of equity and good policy towards the Irish. "Extensive views, liberal sentiments, and a generous zeal for public happiness would have prompted them to some measures for conciliating the affections as well as for subduing the persons and pos-

sessious

essions of the Irish; would have led them to demonstrate that they were the protectors and benefactors, not the arbitrary masters of those Irish natives whom they held in subjection; and to convince the most obstinate insurgents, that an honourable submission to the king of England was the only means of rescuing them from the miseries of their own petty factions and tyrannies; a glorious exchange of the rudeness, the disorders, and distresses of anarchy for the peace, the dignity, and the valuable advantages of social and civil life."

The next attempt that was made to reduce Ireland was by Richard II., who, in 1394, went there with an army of 4000 men at arms, and 30,000 archers, attended by a number of distinguished noblemen. The presence of such an army induced all the chieftains to make submission in a formal manner, with which Richard was contented. By this expedition he did not extend the English jurisdiction, nor add to his revenue; and he had no sooner departed than the Irish lords laid aside their masks of humility, and scorned the weak forces which the king had left behind him, began to infest the borders, and in defence of these, Mortimer, the king's lieutenant, and heir apparent of the crown, was slain. To revenge his death, Richard went to Ireland a second time with a great force; but during his absence, an insurrection took place in England, which terminated in his deposition. During the reigns of Henry IV. and V. nothing was attempted beyond the defence of the English pale, including four counties, *viz.* Dublin, Kildare, Meath, and Louth; and during the early part of the reign of Henry VI., so much had the Irish, and those English who had adopted their customs, increased in strength, that even the defence of those countries was become a matter of great difficulty. Towards the latter end of the reign of Henry VI., Richard, duke of York, was appointed chief governor, who, though he gained little advantage over the Irish, succeeded in attaching to himself not only the lords of the pale, but others of English race, numbers of whom engaged warmly in the support of his claim to the crown. An attachment to his descendants long continued to influence the Anglo-Irish, as was conspicuous in the reign of Henry VII. During the period of the civil wars, the state of Ireland was very bad, in consequence of the neglect of the English government; and the exaction of coin and livery, which grew excessive and intolerable. Such was the violence of faction, that the earl of Desmond, the most powerful nobleman in Ireland, was seized and beheaded under the pretext of offences which were generally committed with impunity. In 1474, the earl of Kildare, being lord deputy, formed an association of the principal noblemen and gentlemen within the pale for its defence against sudden invasion, called the "Brotherhood of St. George," and this continued till the tenth year of Henry VII. This prince, as soon as he found leisure to attend to the affairs of Ireland, was determined to break the power of those lords who, by their influence in the country, had hitherto managed every thing as suited their own private views. For this purpose he sent sir Edward Poynings as lord deputy, accompanied by an English chancellor and treasurer, and English judges. In a parliament held at Drogheda, by this deputy in 1495, most of the statutes of Kilkenny were revived and confirmed, with many others tending to lessen the influence of the great lords, and to reform the manners of the pale. Amongst others was a statute, which has since been the subject of much discussion, under the name of Poynings' law. This enacted, that no parliament should be held without the king's previous permission, and that no acts should be passed until they had been previously sub-

mitted to the king and his council in England, approved by them, and returned under the great seal of that realm. Some alteration was afterwards made in the mode of preparing and transmitting the bills, but the effect of this law, which was to render the Irish government more dependent on England, continued until the reign of his present majesty, king George III. At the time, and long after, this law was considered by the English settled in Ireland as a desirable check on the chief governors, who had frequently summoned parliaments, and given assent to various acts, not only without communication with the sovereign or his English council, but even contrary to his interest, and to serve their own private purposes. The vigorous administration of the earl of Kildare effectually preserved the pale, and though an ignominious tribute, which had been long paid to many Irish chieftains, was not yet withdrawn, the hostilities of such chieftains were opposed and chastised. The superiority of the English government over the *wholes* of Ireland was once more asserted, and even some of the most ferocious chieftains became the avowed friends of the English power. On the other hand, the old English settlers had become so connected with the Irish as to be scarcely distinguishable from them; they adopted their language and customs, and were even more adverse to the government than the native Irish. During the early part of the reign of Henry VIII. no material change took place in the state of Ireland, which Kildare, with some little interruption, continued to govern. The great possessions of this nobleman, and his connections in Ireland, especially with the house of Desmond, another branch of the Geraldine family, and with the great Irish sept of O'Neil, gave weight to his government, whilst his alliance to some powerful English families strengthened his interest at court. Francis I. of France, having, however, sent an agent to tamper with Desmond, with a view to distress Henry, and this having been discovered, Kildare was ordered to arrest that nobleman, but was either unwilling or unable to effect it. This displeased the king and involved him in difficulties, and the rashness of his son having involved him in open rebellion, all the members of his family were put to death, except a youth of twelve years old, who escaped to Italy, and was protected by cardinal Pole, notwithstanding the king's efforts to destroy him.

Whilst these disturbances took place in Ireland, the king, influenced by very unworthy motives, though his conduct was attended with the most happy effects, had thrown off the yoke of the pope, and had been declared by parliament, and by a convocation of the clergy, "supreme head, on earth, of the church of England." His new queen was partial to the reformation, and Cromwell, his prime minister, was active in promoting it. Henry was resolved to extend his new power to Ireland, and Browne, archbishop of Dublin, a creature of Cromwell's, was zealous in promoting his views. Ireland, however, was much less prepared for such measures than England had been. The continual hostilities in which all parties were engaged, prevented the progress of knowledge and civilization, even within the English pale, and the clergy, especially in remote parts, were amongst the most ignorant, and consequently the most bigotted, partisans of Rome. A decided opposition was therefore given to the acknowledgment of the king's supremacy, headed by the primate, and encouraged by the emissaries of Rome. Fear indeed induced the parliament to pass the proposed act, Browne having pronounced those, who made any difficulty of concurring with him, to have no right to be regarded or treated as loyal subjects; but great resistance was made to the carrying of it into effect. Lord Leonard Grey, the

deputy, who had reduced the power of the Geraldines, now shewed equal activity in suppressing the advocates of Rome, and by a great victory over O'Nial and his associates at Bellahoe, put an end for a time to open resistance. The suppression of the monasteries was carried into effect, and the most powerful and turbulent chieftains appeared earnest to express their attachment to the crown. Sir Anthony St. Leger assumed his charge as governor in 1541, with the fairest presages of tranquillity and public happiness. A parliament summoned by him declared Henry king of Ireland; this title, now first assumed, was acknowledged by O'Nial, and the other chieftains by indenture, and they at the same time renounced the papal authority in the fullest manner. Various regulations were passed for the government of Munster, where the laws of England, though formerly established, had been disused for 200 years. St. Leger also prevailed upon O'Nial, O'Brien, and the head of the Burkes called Mac William, to go into England, and present themselves to the king, who conferred on them the dignity of earls, and granted unto them their several countries by letters patent. He also granted to each a house and lands near Dublin, that they might, by frequent residence there, learn obedience and civility of manners. The reign of Edward VI. was chiefly occupied in endeavours to introduce the reformed liturgy, which was effected in Dublin and some other places, but was very generally disagreeable. On the accession of Mary, popery was restored without any difficulty, except that occasioned by the alienation of church property in the preceding reigns; but the regulations which the change required occupied much time and attention. The districts of Leix and Ophaly, which had been before reduced, were now made shires under the names of the Queen's and King's counties, and the native Irish were, in general, not adverse to a government which favoured their religion. The reign of Mary, however, was short, and her successor Elizabeth was friendly to the reformation. Before we proceed to notice the more interesting transactions of this long reign, it will be useful briefly to consider the state of the country. The inhabitants have been classed in four divisions: 1. The native, or, as they were contemptuously called, the mere Irish. 2. The degenerate English, or those of English descent who had intermarried with the Irish, and adopted their customs and language, so as to be scarcely distinguishable from them. They were alike governed by the Brehon law, for an account of which see the article BREHON; and alike used the mode of succession called Tanistry, for which see TANISTRY. 3. The English of blood, some of whom were possessed of large estates, and though the situation of the country did not allow of much refinement, yet their occasional intercourse with England, or with the English constantly coming over, enabled them to keep up an exterior appearance of English manners. These chiefly resided within the pale. 4. The English of birth, sent over to fill the principal offices of state, and who generally acquiring property in the country, their descendants were continually forming an addition to the 3d class. These, who might have been called mere English, as they were ever disposed to sacrifice the interest of Ireland to that of England, were the persons countenanced and assisted by the English government. Spenser the poet, who resided in Ireland for some years in this reign, has described several of the Irish customs in his dialogue on the state of Ireland; and, though it must be remembered that he saw every thing through the eye of prejudice, yet a quotation or two may enable us to form a more correct idea of the licentiousness of manners of the Irish chieftains. Whatever opinion we may form of the im-

licy and injustice of the English settlers and government on many occasions, it must be acknowledged that the Irish laws and customs were favourable to a savage wildness of manners inconsistent with the happiness of social and civil life. After noticing the barbarous manners of the Gallowglasses or infantry, of the Kernes or predatory cavalry, and of the horse boys, Spenser also describes two classes of men who contributed very much to the dissoluteness of the chieftains, viz. the Bards and the Carrows. "These Irish bards," says he, "are so far from instructing young men in moral discipline, that they themselves do more deserve to be sharply disciplined; for they seldom use to choose unto themselves the doings of good men for the arguments of their poems, but whomsoever they find to be most licentious of life, most bold and lawless in his doings, most dangerous and desperate in all parts of disobedience and rebellious disposition, him they set up and glorify in their rhymes, him they praise to the people, and to young men make an example to follow." Then, having described the youth of one of these chieftains, he adds "in which, if he shall find any to praise him, and to give him encouragement, as those bards and rythmen do for little reward, or a share of a stolen cow; then waxeth he most insolent, and half mad with the love of himself and his own lewd deeds. And as for words to set forth such lewdness, it is not hard for them to give a goodly and painted show thereunto, borrowed even from the praises which are proper to virtue itself. As of a most notorious thief and wicked outlaw, who had lived all his lifetime of spoils and robberies, one of their bards in his praise will say, 'That he was none of the idle milk-sops that was brought up by the fire-side, but that most of his days he spent in arms and valiant enterprizes, that he did never eat his meat before he had won it with his sword; that he lay not all night slugging in a cabin under his mantle, but used commonly to keep others waking to defend their lives, and did light his candle at the flames of their houses, to lead him in the darkness; that the day was his night, and the night his day; that he loved not to be long wooing of wenches to yield to him, but where he came, he took by force the spoil of other men's love, and left but lamentation to their lovers; that his music was not the harp, nor lays of love, but the cries of people, and the clashing of armour; and finally, that he died not bewailed of many, but made many wail when he died that dearly bought his death.' At the same time, in answer to a question respecting these poems, 'Whether they be any thing witty or well favoured as poems should be,' this excellent judge replies, 'Yea truly, I have caused divers of them to be translated unto me, that I might understand them, and surely they favoured of sweet wit and good invention, but skilled not of the goodly ornaments of poetry; yet were they sprinkled with some pretty flowers of their natural device, which gave good grace and comeliness unto them, the which it is great pity to see abused, to the gracing of wickedness and vice, which, with good usage, would serve to adorn and beautify virtue.' These bards probably had as great effect in rousing a spirited opposition to the English as the Welsh bards, whom the policy of the first Edward led him most iniquitously to destroy. As to the Carrows, they are 'a kind of people that wander up and down to gentlemen's houses, living only upon cards and dice, the which, though they have little or nothing of their own, yet will they play for much money, which, if they win, they waste most lightly, and if they lose, they pay as slenderly, but make recompence with one stealth or another, whose only hurt is not, that they themselves are idle fellows, but that, through gaming, they draw others to like lewdness

fewdness and idleness. And to these may be added another sort of like loose fellows, which do pass up and down amongst gentlemen by the name of jesters, but are indeed notable rogues, and partakers not only of many stealths, by setting forth other men's goods to be stolen, but also privy to many traitorous practices, and common carriers of news, with desire whereof you would wonder how much the Irish are fed."

Almost the whole of the two first classes, and the greater part of the English of blood, were zealously and blindly attached to the doctrines and discipline of the church of Rome, in which they had been educated, and were therefore easily instigated to support Philip of Spain, a Catholic prince, to whom they had once been subject against their Protestant mistress. In 1560, the first parliament in this reign was assembled for the purpose of re-establishing the queen's supremacy and the reformed worship. The house of commons consisted of only 76 members, from those parts where the English interest was strongest, yet the change was not effected without much clamour and opposition. Laws, however, were passed, restoring ecclesiastical jurisdiction to the crown, enforcing the use of the common prayer, and obliging all subjects to attend the public service of the church. But though the deputy succeeded with parliament, the measures were very unpalatable. "The numerous partizans of Rome inveighed against the heretical queen, and her impious ministers. The clergy who refused to conform abandoned their cures; no reformed ministers could be found to supply their places; the churches fell to ruin; the people were left without any religious worship or instruction. Even in places of most civility, the statutes lately made were evaded or neglected with impunity. The ignorant were taught to abominate a government, which they heard consigned to all the terrors of the divine vengeance; were exhorted to stand prepared for a glorious opportunity of asserting the cause of religion; and assured of effectual support, both from the pope, whose authority had been profaned, and from the king of Spain, now particularly offended at Elizabeth."

Besides the disorder occasioned by these efforts to force upon the people a religion they detested, much uneasiness was occasioned to the government by the restless turbulence of Shane or John O'Nial, the most powerful chieftain in Ireland. Sir Henry Sidney, to whom Elizabeth entrusted the government for many years, and who deserved her confidence, succeeded in attaching to him several inferior chieftains whom O'Nial had injured, and with their aid completely subdued him. But scarcely was the northern disturbance allayed, than another broke out in the south, headed by the earl of Desmond, which was of longer continuance. Sir John Perrott, president of Munster, an office lately instituted, not only suppressed the rebellion, but enforced such a strict execution of English law, as to give an unusual appearance of peace, industry, and civility, to the whole province. Peace, however, was of short continuance, and an attempt of Sidney to raise a tax by order of council, without authority of parliament, excited a most determined opposition on the part of the nobility and gentry of the pale. These discontents were encouraged by the emissaries of Philip II.; a body of Spaniards landed in Kerry, who acted in concert with Desmond; and a protracted warfare was maintained, which, as usual, terminated in favour of the English. The enormous demesnes of Desmond were forfeited, and divided amongst a number of English *Undertakers*, as they were called, who entered into a stipulation to plant a certain number of English families on their estates, in proportion to the number of acres, a stipu-

lation frequently neglected to the great injury of the settlement. Amongst others who received portions, were fir Walter Raleigh, who had served with reputation for bravery, though not without the stain of cruelty, and Edmund Spenser, the poet, who has introduced several allusions to Ireland into his *Fairy Queen*. In 1584, fir John Perrott was sent over as chief governor, and as war and insurrection seemed to be then extinguished, he applied himself to the general extension of English law with considerable success. He nominated sheriffs for the counties of Connaught, and also for seven new counties instituted in Ulster, with other necessary officers; but his plans for more extensive improvement were thwarted in England from ill-timed economy, and notwithstanding all his exertions, a parliament, summoned by him in the following year, rejected almost every measure proposed to them. The oppression of the natives by the English settlers, which Perrott in vain endeavoured to repress, supplied new causes of discontent; and this active governor was at length obliged to leave Ireland. A more general spirit of insurrection than at any former period was now excited, and Elizabeth found it necessary to make uncommon efforts, lest England should be placed between the forces of Spain collected in the Netherlands, and their naval strength and armaments stationed in the harbours of Ireland. The misconduct of successive governors, especially of Elizabeth's favourite, the earl of Essex, who had an army of 20,000 men, increased the danger, and before the rebels were subdued, a Spanish army took possession of Kinsale, and a nuncio arrived from the pope to instigate the friends of Rome to make every exertion. The abilities and exertions of Blount, lord Mountjoy, lord deputy, and of fir George Carew, president of Munster, assisted by considerable reinforcements from England, at length effected the surrender of the Spaniards, and the complete reduction of all the lords and chiefs, who, until then, had ruled in the island, after a war which lasted about seven years. Elizabeth did not live to see this event, the final capitulation not having been signed until a few days after her death, though before the news of it had reached Ireland.

The reign of James I. was one of at least comparative tranquillity. All violent opposition to the authority of the English government and crown was put an end to. "The spirit of Irish resistance," to use the expressions of fir John Davies, "was brayed, as it were, in a mortar, with the sword, famine, and pestilence altogether." Both the degenerated English and the native Irish were alike overcome. At the same time the power of the judges and of the English government was extensively fixed, the Irish laws and customs were abolished, and the English laws established in all cases, without exception, through the whole island. Numerous colonies were also sent from England and Scotland, especially from the latter, to occupy the forfeited estates, and seven entire northern counties were allotted to undertakers, which was called the "Plantation of Ulster," a measure which was certainly attended by the introduction of industry and order into that province. With a view to strengthen the Protestant party, great care was taken that these settlers should be Protestants, and they were chiefly Scotch Presbyterians, or English Puritans, the latter of whom found their situation at home uneasy, from James's zealous attachment to their adversaries. For the same purpose, many new boroughs were erected, so as to give a majority in parliament to the same party, which they could not otherwise have accomplished, as the county members were likely to be almost all Papists. It would have been at this time a wise and liberal policy to have completely united the two countries, so as to

have but one parliament, which might have been easily effected at that time. This would have rendered such extraordinary proceedings entirely unnecessary, and would in all probability have prevented much of the mischief which afterwards occurred; but the settlers were considered as a colony, dependent on the mother country, to whose interest they were to be subservient, without presuming to interfere in any but the petty regulations of their own island, and all but the colony were regarded as secret enemies, who could not be too carefully watched, or too strictly kept in subjection. In consequence, the distinctions which had subsisted amongst them were in a great measure done away, and they united in defence of a religion to which they were equally attached, and of rights which they conceived to be equally invaded. Such was the prevailing sentiment, when, after an interval of *twenty-seven* years, a parliament, summoned by Chichester, the deputy, met in 1613. The recusants, (as they were called, from their refusal to acknowledge the king's supremacy, and to attend the established worship,) were prepared to dispute every step, and were numerous in both houses. Such indeed was their resistance, that, although the bishops in the upper, and the new borough members in the lower house, gave government a majority, it was found necessary to prorogue them until the following year, when acts for acknowledging the king's title, for settling upon him a revenue, and for confirming the northern attainders, were passed. During the remainder of this reign, and for the early part of the succeeding one, the two contending parties often shewed their rancour without proceeding to extremities, whilst the period of peace was employed by some in active exertions for the establishment of manufactures, and the extension of cultivation. In 1633, lord Wentworth, better known by his later title of earl of Strafford, commenced his administration. He treated Ireland with severity, as a conquered country, the subjects of which had forfeited the rights of men and citizens, and depended solely on the royal grace. The recusants and the Puritans were equally offended by his measures; yet, by artfully plying one party against the other, he contrived to manage a parliament which he summoned, and to perform many acts of severity with a vigour beyond the law.

At length the time arrived when Ireland was to be once more involved in war and bloodshed. The impeachment of lord Strafford before the English parliament was one of the first steps to the overthrow of the royal authority. The severe restrictions imposed on the Catholic party, which, as before observed, included almost all the inhabitants, except the new settlers, led them to watch for an opportunity of revenge; and the distracted state of affairs in England affording a favourable opportunity, a general insurrection was planned, and carried into execution on the 23d of October 1641, an event productive of the most baneful consequences to the peace, union, and prosperity of Ireland. This civil war, or rebellion, as it is justly called, even admitting the palliations that have been urged, was begun by the native Irish, and they were afterwards joined by most of the Catholics. Happy would it be for the country if the acts of violence then committed could be for ever buried in oblivion. The writers on both sides are charged with partiality by their opponents; yet what they admit respecting their own parties is enough to shew that there was on both sides much to blame, and much to lament. For eleven years Ireland was a scene of confusion, there being no less than five different parties, of whom it has been said, that each, in the course of the war, at one time or other, fought against the faction with which it had formerly sided. At length, in 1652, Cromwell assumed the command of the parliamentary

army, to which he brought a considerable reinforcement, and soon completely reduced the whole island. The lands which had belonged to those who had been killed, or who were deprived of their possessions by force of arms, were now given to new colonists, many of whom had been officers in the victorious army. Limits were assigned to the Irish, beyond which they were not to come, and these continued to be strictly enforced till the restoration. The Protestant and English interest was now more completely established than at any former time; but though the Catholics had lost the power to injure, they retained their animosity. At this period, indeed, the interest and power of the old native Irish, as a distinct class of inhabitants, was entirely broken, their numbers being from that time much exceeded by those of the old and new inhabitants of the British race.

On the restoration it was hoped that the king would have overturned all the measures of Cromwell; but he confirmed all the grants, and the situation of the Catholics was little, if at all, amended. The duke of Ormond, who had great influence in Irish affairs, was a steady Protestant; and whatever might be the king's private wishes, no steps were taken in favour of the opposite party till near the conclusion of his reign, when his brother the duke of York appears to have had great influence over him. On the accession of James II. the Romish party in Ireland were inspired with the most extravagant expectations; they fancied themselves already restored to the estates of their ancestors, and possessed of every advantage to be derived from a king of their own religion. "At length," says Mr. Newenham, "the infatuated James, yielding to the impolitic counsels of men who, perhaps, might have governed a religious fraternity well, but who were utterly ignorant of the government of an empire; and taught to regard the Irish Roman Catholics as fit instruments for the accomplishment of his visionary and despotic projects, gradually raised, invigorated, and encouraged them. By the obsequious forbearance, or constrained acquiescence of Clarendon, and the indefatigable exertions of the zealous and plenipotent Tyrconnel, they were once more prepared to renew the terrible conflict; and animated by no ordinary combination of forcible motives, recurred to arms; after incautiously co-operating with their bigoted sovereign, in persecuting their Protestant countrymen without measure and without remorse; and thus, in some degree, justifying that severe retaliation which they themselves were soon after to experience.

—Ehen,

Quam temere in nosmet legem sancimus iniquam.

But England was not then, as on the preceding occasion, paralyzed by internal commotions. The prince who had ascended the abdicated throne was an experienced general, and a sound politician. The visionary James was greatly overmatched. The Irish Roman Catholics were, in consequence, completely vanquished; stripped of political power; hurled from every post of trust and emolument, and almost entirely dispossessed of their remaining lands. The work of vengeance, however, was not yet finished, nor could it perhaps have terminated thus, consistently with the weakness and wickedness inseparable from human nature. The Irish Protestants, still horrified by the remembrance of the ferocious massacre of 1641; recollecting the havoc and misery of the long war which succeeded that event; dreading a repetition of the tyrannical measures, the relentless, and, for the most part, unprovoked persecution from which they had been recently rescued; and a renewal of those bloody scenes which they had just survived; yielding, in short, to the united impulse of revenge and fear, and thereby hurried beyond

yond the bounds of political honour and prudence, resorted in the following reign, when they were rather encouraged to do so, to every expedient which legislative ingenuity could supply, however likely to prove ultimately detrimental to themselves, with a view of reducing their inveterate enemies, the Roman Catholics, to absolute and irremediable political impotence. A code of defensive and preventive statutes, being the stamp of the passions by which it was originated, was in the end compiled: a code which was not merely limited to the preclusion of hostilities on the part of the Roman Catholics, but extended to the abolition of their venerated religion, which, in Ireland, had scarcely ever been fairly combated by the only weapons that ever should have been employed against it, the pens or tongues, and attractive examples of Protestants; a code which impeded the progress of the former in the paths of industry; thwarted every species of laudable ambition by which they might have been actuated; placed them on the footing of aliens in their native land; exposed them to vexations outrages and spoliation; reduced them almost to the condition of slaves; obstructed matrimonial alliances between them and the Protestants, from whence, it is probable, the happiest effects might have flowed; and, worse than all, held forth incitements to filial contumacy, to a violation of one of the commandments of God; and introduced amongst them principles of duplicity and treachery. A code, which, while it oppressed, and seemed to overwhelm the Roman Catholics, facilitated the obstruction of those jealous measures, those commercial restraints which had long been the effect of retaining one of the fairest portions of the globe in a state of poverty and political insignificance. The massacre of 1641, which had been industriously exhibited in the most horrifying colours, together with the cruel persecution experienced during the short reign of king James in Ireland, both still fresh in the recollection of the Protestants, necessarily heightened their animosity to the utmost; while repeated discomfures and disasters, and aggravated oppression, together with the accumulated misery produced by this revengeful code, certainly inconsistent with the principles of sound policy and true religion, naturally rendered the hatred of the Roman Catholics virulent beyond example. An unparalleled combination of irritating, mad-denying circumstances fomented, on both sides, the most rancorous malignity. The idea of a Protestant in the mind of a Roman Catholic, and that of the latter in the mind of the former, now became closely associated with every idea that could engender wrath, malice, and vengeance in the heart of man. Each abhorred the other; each longed for the extirpation of the other."—"This among countrymen, among the friendly, cheerful, and hospitable people of Ireland, among Christians, among those who looked forward to eternal happiness through the mediation of the same Saviour, among those who adored the same Trinity, among those who agreed in all the essential points of religion, the maintenance of a few different speculative articles, and the observance of a few different rites, confessedly inoperative in social life, and consequently unworthy of serious notice, being unhappily combined with opposite interests, being coeval and concurrent with the most energetic principles of discord, serving as the tests, symbols, or distinctive characters of two parties inveterately and unappeasably hostile to each other, became at length, what in their natural unconnected state they could never possibly have become, alimentary to the most vehement detestation."

Though we cannot agree with the respectable writer of the preceding passage in all his remarks, especially in those which seem to think lightly of the difference between the Protestant

and Catholic faith; yet it, on the whole, contains so just and candid a representation of the unhappy differences between the parties, and is evidently written with such a desire of conciliation, that we have copied it without change, anxiously wishing that all the gentlemen of Ireland, of every sect, saw the matter in the same light, and were equally desirous of improving past evils to present harmony.

The events peculiar to Ireland, excepting the penal code, just remarked on, will not require much notice during the four reigns succeeding the revolution. The uniform policy was to keep Ireland in a state of dependency, and to prevent her manufactures or commerce interfering with those of England.

Encouragement was indeed given to the linen manufacture, and it proved a source of great benefit to the country, but the woollen manufacture was kept down, and the restrictions on commerce shewed a most unwarrantable jealousy. As the dependence of Ireland on England was never lost sight of, so some occasions occurred in which the parliament of the latter directly exerted its authority. In the reign of William acts were passed, by which Ireland was bound. In the year 1698, Mr. Molyneux published a pamphlet, entitled "The Case of Ireland being bound by Acts of Parliament in England, stated," in which he called in question their right to do so, and his sentiments were known to be those of the Irish parliament and people. This book was condemned by the English parliament, which addressed the king on the pernicious assertions it contained, and on the dangerous tendency of the proceedings of the Irish parliament, and promised to give his majesty their ready concurrence and assistance to preserve and maintain the dependence and subordination of Ireland to the imperial crown of this realm. William promised on his part to fulfil their wishes, and notwithstanding the discontent of the Irish people, such was their divided state, and such the apprehension each party entertained of the other, that they were obliged to submit. Another cause of controversy occurred in 1719, in consequence of an appeal being carried from the Irish to the English house of lords. The barons of the exchequer, who had carried into effect the decree of the English house, were imprisoned by the Irish one, but the dispute terminated in a new act, by which it was enacted, "that the kingdom of Ireland is subordinate unto, and dependent upon, the imperial crown of Great Britain; and that the king's majesty, by and with the consent of the lords and commons of Great Britain, has full power and authority to make laws and statutes to bind the people and the kingdom of Ireland." Soon after this, in 1723, a circumstance occurred, which deserves notice, both on account of the example it set, that the united, determined, and persevering voice of a people must be ultimately successful, and on account of the active part taken by the celebrated dean Swift, then resident in Dublin. This was the well known affair of *Wood's halfpence*. A patent had been granted to a Mr. Wood, to supply Ireland with a certain quantity of copper halfpence and farthings for 14 years. It was alleged in Ireland, that this coin was greatly inferior in value to what it was made to pass for. The parliament of Ireland addressed the crown against the measure of sending the coin; and during their following biennial recess, great complaints continued to be made both by individuals and by public corporations. It would appear that though the badness of Wood's halfpence was the pretext, the dispute was, in reality, a question of rights and independence. Dean Swift contributed much to the public discontent, by a series of letters signed *A Drapier*, for discovering the author of the fourth of which, a reward of 300 pounds was offered. As such precautions

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precautions had been taken, that no evidence could be procured against the author, the printer was indicted, but the grand jury, instead of finding the bill, approved the publication. The ferment was so great, that if ministers had persevered, a new civil war would probably have arisen, though it, like all preceding ones, would have only contributed, in all probability, to rivet the chains of Ireland more firmly. As it was, the patent was cancelled, and the ferment allayed. At this time the complaints of the people, on other accounts, were loud, of which dean Swift takes particular notice in his "Short View of the State of Ireland;" he compares this kingdom, in which a few placemen from England enjoyed plentiful salaries, to an hospital, in which all the household officers grow rich, while the poor, for whose sake it was built, are almost starving for want of food and raiment. Such are the principal events in Ireland, in the interval between the revolution and the accession of his present majesty to the throne in 1760. The Catholics were under the disabilities already stated, but the penal laws against them were seldom, if ever, enforced; and as the distance of time increased, the irritation occasioned by former events was considerably abated. Many of that body acquired wealth in the way of trade, and the nobility and gentry enjoyed their estates in quiet. The Protestants also gradually lost their apprehensions, and were taken up with the contests against British sovereignty, which about this time gave a continual interest to the proceedings of parliament, where some able men distinguished themselves by their opposition to government. This parliament was unchanged during the life of the sovereign, and met every second year; and as the present mode of vacating seats was unknown, when a vacancy happened by death, the greatest exertions were used by the contending parties, and the election was usually decided by the majority of the house. The Irish government was peculiarly circumstanced. It was necessary that every act of parliament should have the sanction both of the British privy council, *i. e.* of the British ministry, and of the Irish parliament. It was therefore necessary for the former to be able to influence a majority of the latter. To do this, places and pensions were bestowed on these, whose powers of eloquence, or whose parliamentary interest made them serviceable; and besides this, the ministry were obliged to gratify the leading faction, by complying with such measures as were for their private advantage, although inconsistent with sound policy, and the true interest of Ireland. Hence a number of parliamentary grants, which have been justly stigmatized as jobs, and hence the undetermined conduct of the British ministry respecting Irish measures, even on occasions not long preceding the Union. The leading party in the Irish parliament must be gratified, because otherwise the public business would be at a stand. The lord lieutenant was not resident, except during the parliamentary session; and the management of affairs was, at other times, entrusted to lords justices, generally the primate, the chancellor, and the speaker of the house of commons; the two former invariably Englishmen, in whom confidence was chiefly placed, and the last, a man always possessed of great parliamentary influence from his talents and connections. The first step to a change was the rendering parliaments octennial, which was moved by G. D. Lucas, and passed in 1768. The lord lieutenant now became constantly resident, and the sessions were held every year. The spirit of the Irish parliament increased; several men of great talents sprung up, and whilst the British ministry were engaged in their unhappy contest with America, they were obliged to yield to the people of Ireland first a free trade, and afterwards a repeal of the statutes which rendered Ireland de-

pendent. The volunteers, a body originally armed for the defence of the country against French invasion, probably contributed to these measures by the terror they occasioned to the ministry, whilst the agitation in England towards the close of the American war, and the unsettled state of administration between the resignation of lord North, and the appointment of Mr. Pitt, prevented that determined opposition which would have been made in a more settled state of affairs. In 1778 the grievances of the Roman Catholics began to receive attention, and that body was restored to many privileges, of which they had been harshly deprived. This was the commencement, and since that time all the most harassing disabilities have been removed, though some still remain, which are frequently the subject of parliamentary discussion. The events of the last 20 years are too recent to be enlarged on without that partiality from which human nature is scarcely ever exempt, and the detail would be perhaps unsuitable to a work of this general nature. Notwithstanding the misery occasioned by the rebellion of 1798, and the low state of many branches of trade and manufacture, Ireland has rapidly improved within that period, especially in agriculture, and should it be blessed with internal peace and union, it will soon, under the fostering care of the legislature, rise to a great degree of prosperity, and essentially contribute to the welfare and happiness of the *United Kingdom*. See *UNION*. Beaufort's Memoir. Pinkerton's Geography. Spenser. Cox. Davis. Hollingshead. Leland. Curry. Newenham's State of Ireland, &c. &c.

NEWENHAM'S EYE, a small island in the Irish sea, north of the hill of Howth, in the county of Dublin, Ireland, about a mile from the main land.

IRELAND, NEW, an island in the Pacific ocean, which is a long slip of land stretching from N.W. to S.E. about 270 miles, and separated from *New Britain* (which see) by a channel through which Capt. Carteret passed in 1767, who gave its name to this island. This navigator found the nation very hostile, having lances headed with flint. Their faces were streaked with white, and their hair besprinkled with powder of the same colour. They are black, and said to be woolly-headed, but without the thick lips or flat nose of the negro. Some of the canoes of this island were 90 feet in length, formed out of a single tree. Bougainville also visited this country, and observed here the pepper-plant, and that singular insect, the walking leaf; among its numerous birds was the great crowned pigeon. To the west of New Ireland, and approaching New Guinea, a succession of little Archipelagos is found; in which are the Portland isles, the Admiralty isles, the Hermit and Exchequer isles; all of which present one principal island, the centre of the group, of which the circumference is formed by a number of flat islets linked together by reefs. The principal island of the *ADMIRALTY ISLANDS* (which see) is mountainous. The inhabitants are not very black. Their physiognomy is agreeable, and differs but little from that of the Europeans; they appear little sociable, and thieves; they have chiefs who exercise great authority; they are armed with darts headed with a volcanic glass. They wear at the extremity of the natural parts the shell "*bullæ ovum*;" and are otherwise entirely naked. The women have only a garment about the waist. They live chiefly upon cocoa-nuts, of which these isles have abundance. Their hair is curly, and of a black colour, which they sometimes redden with ochre mixed with oil; many parts of the body are also thus painted, and especially the face. In these islands it was once hoped to find *Lá Perouse*.

The archipelago of *Hermit's* is scarcely 14 leagues in circumference; it produces Cytherean apples, "*Spondia cytherea*,"

therea," and many fruits of different species of "Eugenia," all good to eat. The natives appear more mild and pacific than those of the Admiralty isles, though they seem to be more robust. They are wholly naked, not even wearing the shell. All these islands, and those about them, are covered with trees. Labillardiere. Pinkerton. The most southerly point of New Ireland is situated in S. lat. $4^{\circ} 59'$. E. long. $152^{\circ} 17'$.

IRELAND, one of the Bermuda islands.

IRELLY, a town of Hindoostan, in Golconda; 25 miles E. of Hydrabad.

IRENÆUS, in *Biography*, a native Greek, probably of Asia, and bishop of Lyons, in Gaul, in the second century. The time of his birth, and the precise place of his nativity, cannot be satisfactorily ascertained. Dodwell refers his birth to the reign of Nerva, A. D. 97, and thinks that he did not outlive the year 190. Grabe dates his birth about the year 108. Dupin says that he was born a little before the year 140, and died a martyr in 202. Tillemont thinks that he was born about the year 120, and died in 202. It is generally allowed that he was educated in the principles of the Christian religion, and that he was a disciple of St. Polycarp; and it has been supposed that he came to Rome with his matter, in the time of Anicetus, about the year 157, and from thence passed into Gaul. He was first presbyter of the church of Lyons, and succeeded Pothinus, after his martyrdom in the year 177, as bishop of that church. Tertullian mentions him as one of the most considerable writers of the Christian church, and says of him that he was "a diligent inquirer of all sorts of opinions;" meaning, probably, that he had well studied the sentiments of the heathen philosophers, and of heretics, as well as the principles of the Christian religion. It has been commonly said that Irenæus died a martyr; but from the silence of Tertullian and Eusebius, and others, concerning the manner of his death, it is justly argued (says Lardner) by Cave, Basnage, and Dodwell, that this supposition is not well founded, and that he closed his life in the ordinary course of nature. He was the author of many works, of which none are now extant besides his five books "Against Heresies," and fragments of some other pieces; and those five books, written by him in Greek, now exist only in an ancient Latin version, excepting some fragments preserved by Eusebius, and other Greek writers who have quoted them. In this large work "Against Heresies," Irenæus has shewn that he was well acquainted with heathen authors, and the absurd and intricate notions of heretics, as well as with the scriptures of the Old and New Testament, which he has frequently and copiously cited with peculiar and very distinguished respect. In his writings "we have full, express, and abundant testimony to the four gospels, the acts of the apostles, and twelve of Paul's epistles. The omission of the epistle to Philemon may well be ascribed to its brevity. He knew the epistle to the Hebrews, but was not satisfied that it was Paul's. As for the Catholic epistles, we have express quotations of the first of Peter, and the first and second of John; and the reason of not quoting the third may be well allowed to be its brevity. But to the epistle of James, the second of Peter, and the epistle of Jude, there are none, or very obscure references, hardly any that can be reckoned material. Nevertheless, on account of a general passage concerning the writings of the apostles, it may be questioned, whether he did not also know the epistles of James and Jude. The book of the Revelation is expressly ascribed to John, the disciple of the Lord. His testimony for this book is so strong and full, that, considering the age of Irenæus, he seems to put it beyond all

question, that it is the work of John the apostle and evangelist."

Irenæus appears to have been very humble and modest, and agreeable to his name (formed of *ειρην*, *peace*) a lover of peace. This is manifest in his letter to Victor, on occasion of the controversy about the time of keeping Easter. Although his writings may not be free from imperfections, he has given such proofs of learning, integrity, and good sense in the main, that all good judges must esteem him an ornament to the sect to which he belonged. The works of Irenæus were first published at Basil by Erasmus, in 1526, in folio; and they have since undergone various impressions. The most valuable of these are that of Grabe, published at Oxford in 1702, folio; and that of Mafluet, a Benedictine of the congregation of St. Maur, published at Paris in 1710, folio. Fabricius. Cave. Dupin. Lardner, in his Works, vol. ii.

IRENARCHA, *ειρηνάρχης*, composed of *ειρην*, *peace*, and *αρχος*, *prince*, from *αρχη*, *command*, a military officer in the Greek empire, whose business was to provide for the peace, security, and tranquillity of the provinces.

In Justinian's code it is mentioned, that *irenarchæ* are sent into the provinces to maintain the public peace, by punishing crimes, and putting the laws in execution.

Besides this there was another *irenarcha* in the cities, to whom belonged the preserving of peace, and quelling sedition among the citizens. This officer was sometimes called *praefectus urbis*.

The emperors Theodosius and Honorius suppressed the office of *irenarchæ*, on account of their abusing their trust, and distressing and persecuting the people, instead of maintaining peace among them.

IRENE, in *Biography*, empress of Constantinople, born in the year 752, was an Athenian orphan, but being distinguished by her great accomplishments she was married, at the age of 17, to Leo, son of the emperor Constantine V. This prince afterwards sat upon the imperial throne as Leo IV. and at his death, in 780, left his wife guardian of their son, Constantine VI. then but 10 years old. During his childhood, Irene most ably and assiduously discharged, in her public administration, the duties of a faithful mother; and her zeal in the restoration of images, has given her the title and honours of a saint, which she still holds in the Greek church. As the young emperor attained the maturity of youth, the struggle for power between him and his mother was carried on with the utmost ardour. He listened to his favourites, who shared his pleasures, and were ambitious of his power, and was convinced of his right, and of his ability to reign, and determined to reward the services of his mother by a perpetual banishment to the isle of Sicily. She, on the other hand, saw through his projects in time to frustrate, for the present, his plans. The contest, however, was not over; and the soldiers determining for the prince, he was proclaimed lawful emperor, and his mother was dismissed to a life of solitude. Here she excited a powerful conspiracy against Constantine, and, in 797, not only dethroned him, but most barbarously caused him to be deprived of his sight. After this she entered Constantinople in a chariot of state, attended by several patricians as her slaves, and assumed the reins of empire. "But these patricians," says Gibbon, "were for the most part eunuchs; and their black ingratitude justified, on this occasion, the popular hatred and contempt. Raised, enriched, entrusted with the first dignities of the empire, they basely conspired against their benefactress: the great treasurer Nicephorus was secretly invested with the purple; her successor was introduced into the palace, and crowned at St. Sophia by the

the venal patriarch. In their first interview, she recapitulated with dignity the revolutions of her life, gently accused the perfidy of Nicephorus, insinuated that he owed his life to her unsuspicious clemency, and, for the throne and treasures which she had resigned, solicited a decent and honourable retreat. His avarice refused this modest compensation; and, in her exile in the isle of Lesbos, the empress earned a scanty subsistence by the labours of her distaff." In this forlorn condition she died in the succeeding year. Her zeal for orthodoxy, and her liberality to the church and the poor, have, in the eyes of ecclesiastical historians, almost wholly obliterated her savage cruelty and injustice towards her son. It is universally admitted that she was endowed with a strong understanding, and with great talents for government. Univ. Hist. Gibbon.

IRELINE, in *Botany*, is derived from *ireos*, wool, because this plant, when it bears fruit, is covered with a sort of woolliness. *Eupatorium* was the appellation of an olive-branch entwined with wool, such as was customary for the Greeks to hang up in their houses, in order to avert famine.—Linn. Gen. 521. Schreb. 687. Mart. Mill. Dict. v. 2. Browne Jam. 353. Swartz Obs. 376. Juss. 88. Lamarck Dict. v. 3. 292. Illustr. t. 813.—Class and order, *Diacia Pentandria*. Nat. Ord. *Holeraceae*, Linn. *Amaranthi*, Juss.

Gen. Ch. Male, *Cal*. Perianth of two leaves, very small, acute, shining. *Cor*. Petals five, sessile, lanceolate, erect; nectary of five scales, the stamens being interposed. *Stam*. Filaments five, erect; anthers roundish. Female, *Cal*. and *Cor*. like the male. *Pist*. Germen ovate, superior; style none; stigmas two, roundish. *Peric*. none, except the permanent calyx. *Seeds* few, downy.

Eff. Ch. Calyx two-leaved. Corolla of five petals. Male, Nectaries seven. Female, Stigmas two, sessile. Seeds woolly.

Obs. Professor Swartz has remarked that he never found this plant but with hermaphrodite flowers. He is of opinion that the plant described by Browne might be a distinct species with dioecious flowers. Swartz also says that *Iresine* is so closely allied to *Celosia*, that it almost appears to be a species of this latter genus.

1. *I. celestoides*. Linn. Sp. Pl. 1456. (*Amarantus panicula flavicante gracili holofericea*; Sloan. Jam. v. 1. 142. t. 90. f. 2.)—A native of Virginia and the West Indian islands, particularly Jamaica.—Root perennial. *Stems* varying in height from two to ten or twelve feet, jointed, furrowed, divided at the top. *Branches* opposite, a little spreading. *Leaves* opposite, on foot-stalks, lanceolate or nearly ovate, acute, smooth. *Panicles* terminal. *Flowers* in a sort of spike, small, ovate, whitish, scaly at their base. *Filaments* shorter than the corolla; anthers yellow. The *calyx* resembles a capsule, inclosing one or more black shining seeds. A white wool is protruded from between the segments when the time of flowering is past.

We suspect that another species of this genus, with narrower leaves, is found in Jamaica.

IRETON, HENRY, in *Biography*, a celebrated commander and statesman of the parliamentary party in the civil wars of Charles I., was descended of a good family, and brought up to the profession of the law. In the contents of the period in which he flourished, Ireton joined the parliament army, and by his superior talents, and the interest of Cromwell, whose daughter he married, rose to the high office of commissary-general. At the famous battle of Naseby he was wounded and taken prisoner. By his address he soon obtained his liberty, and had a great share in all those political transactions which threw the parliament into the power of the army, and afterwards changed the consti-

tution from a monarchy to a republic. His councils had great influence with his father-in-law; and his education as a lawyer caused him to be employed in drawing up many of the public papers of his party. From his suggestion, Cromwell secretly called, at Windsor, a council of the chief officers, in order to deliberate concerning the settlement of the nation, and the future disposal of the king's person, and he had a principal hand in framing the ordinance for the king's trial, at which he sat as one of the judges. Through his instigation Fairfax put to death, by martial law, Lucas and Lisle, taken at the siege of Colchester. This unusual severity was loudly exclaimed against by all the prisoners. Lord Capel reproached Ireton with it; and challenged him, as they were all engaged in the same honourable cause, to exercise the same impartial vengeance upon all. Ireton accompanied Cromwell to Ireland in 1649, and in the following year was left by him in that island as lord-deputy. Having finished his military career with the capture of Limerick, he was seized with a pestilential disease in that place, of which he died in November 1651; sincerely lamented by the republicans, who revered him as a soldier, a statesman, and a saint. According to Hume, he was "ferce in his nature, though probably sincere in his intentions; he proposed, by arbitrary power, to establish liberty, and in the prosecution of his imagined religious purposes, he thought himself dispensed from all the ordinary rules of morality, by which inferior mortals must allow themselves to be governed." And again he was "much celebrated for his vigilance, industry, and capacity, even for the strict execution of justice in that unlimited command which he possessed in Ireland. He was observed to be inflexible in all his purposes, and it was believed by many that he was animated with a sincere and passionate love of liberty, and never could have been induced by any motive to submit to the smallest appearance of regal government. In gratitude for his great public services, the parliament voted an estate of 2000*l. per ann.* to his family, and honoured him with a magnificent funeral at Westminster Abbey, a circumstance which, if he could have foreseen, says Ludlow, "he would certainly have made it his desire that his body might have found a grave where his soul left it; so much did he despise those pompous and expensive vanities; having erected for himself a more glorious monument in the hearts of good men, by his affection to his country, his abilities of mind, his impartial justice, his diligence in the public service, and his other virtues." Ludlow's Memoirs. Hume Hist. Life of Cromwell in the Biog. Brit.

IREW, in *Geography*, a town on the S.E. coast of the island of Timor. S. lat. 8° 45'. E. long. 126° 3'.

IRGANONG, a town of Hindoostan, in Baglana; 20 miles S.E. of Saler Mouler.

IRISKOE, a town of Russia, in the government of Saratov, situated on the Irgis, which runs into the Volga, near Volk; 96 miles E. of Volk.

IRI, a town of Africa, in the kingdom of Congo.

IRJAB, a town of Candahar, taken by Timur Bec in 1398; 46 miles S.E. of Cabul. N. lat. 33° 30'. E. long. 69° 8'.

IRIARTE ICAACIO, in *Biography*, a Spanish painter of landscapes, of whom Murillo said, that he would only ascribe the beauty of his works to divine inspiration. He was secretary to the academy at Seville, where he died, in 1685.

IRIDES, in *Botany*, the 18th natural order in Jussieu's System, and the 8th of his 3d class. It is equivalent to the *Enfate* of Linnæus, which latter appellation is properly, in our opinion, retained by Mr. Gawler (now Ker), in his illustration

illustration of this order; see ENSATÆ.—Its characters are thus given, the character of the class being *monocotyledonous*, with *stamens inserted into the calyx or corolla*.

Corolla, which Jussieu terms *calyx*, superior, coloured, tubular at the base, its limb in six more or less deep segments, equal or unequal. *Stamens* three, inserted into the tube, opposite to three alternate segments of the flower, their filaments distinct, or rarely united into a tube embracing the style. *Germen* inferior; with a single style and three-fold stigma. *Capsule* inferior, of three cells, and three valves, with many, generally roundish, seeds.

Root either fibrous, tuberous, or bulbous. *Stem* mostly herbaceous, leafy, rarely almost wanting. *Leaves* alternate, sheathing, mostly sword-shaped. *Flowers* growing out of sheaths, either solitary, or many together, which sheaths often consist of two valves.

The leading genera in Linnæus and Jussieu are *Sisyrinchium*, *Iris*, *Ixia*, *Gladiolus*, *Antholyza*, *Crocus*, &c. which Mr. Ker has greatly sub-divided. See HESPERANTHA and GLADIOLUS.

IRIDIUM, in *Chemistry*, is a simple substance, and a metal. It was discovered by Mr. Smithson Tennant in 1803. and an account of it was published in the Phil. Transf. for 1804. It appears that, previous to its publication, the same discovery was made, to a certain degree, by Descotils, which was afterwards taken up and enlarged upon by Fourcroy and Vauquelin.

Mr. Tennant found that the small black scales existing in crude platina, and which are left after the platina has been dissolved, contained two metals which had not been previously noticed. (See PLATINA.) He subjected the above substance to the alternate action of potash and muriatic acid, by which means he obtained two solutions. The black scales are heated to redness in a silver crucible, with their own weight of potash. When the heated mass has water added to it, the potash dissolves in combination with one of the metals, the solution being of an orange colour. The residuum being treated with muriatic acid, a solution is obtained, which at first is blue, then becomes olive green, and ultimately of a red colour, consisting of the acid united to the oxyd of the other metal. By this alternate treatment, the oxyd of osmium, the other metal alluded to, is dissolved in the potash, and the oxyd of iridium in the muriatic acid. The acid solution, on being evaporated to dryness, affords crystals of an octahedral form, which is, no doubt, a pure muriat of iridium. The solution of these crystals is of a deep red colour. When a plate of zinc, or any other metal, having a greater affinity for oxygen than itself, is placed in the solution, a black powder is precipitated, which, on being heated, becomes white, and puts on metallic lustre. This metal, like gold and platina, has so little attraction for oxygen, that it may be obtained by exposing the crystals of its muriat to a strong heat. In this state it is deemed pure iridium. It is a white metal, having the appearance of platina. Owing to its great infusibility, we are not acquainted with some of its physical properties, such as its specific gravity and malleability. It has not been fused by Mr. Tennant nor the French chemists. It has, however, since been made to assume the liquid form, by means of the very intense heat produced by the large Galvanic battery lately exhibited at the Royal Institution by Mr. Davy. This heat was so great, that at the same time the earths alumine and zirconia were fused, and charcoal was volatilized.

It forms malleable alloys with several of the metals, a presumptive proof that it is itself malleable. Mr. Tennant found that it did not combine with arsenic, but that it easily united with lead; from which, like the noble metals, it may

be separated by cupellation. It forms malleable alloys with copper and silver. Its alloy, with gold, differs little from pure gold, even when the iridium is in considerable quantity. It appears to stand next above gold and platina in its affinity for oxygen. It may be inferred, from the change of colour, in the acid solution, that it admits of at least two stages of oxydation. When the metal is in its pure state, it is not acted upon by any acid except the nitro-muriatic, and even this acid, according to Fourcroy and Vauquelin, dissolves only $\frac{1}{100}$ of its weight. Its combinations with the other acids, and with combustible bodies, have not been attended to. See OSMIUM.

IRIJU, in *Geography*, a river of Guiana, which runs into the Atlantic, N. lat. $0^{\circ} 58'$. W. long. $51^{\circ} 30'$.

IRINON. See IRIS.

IRIS, in *Anatomy*. See EYE.

IRIS, *Prolapsus*, or *Procidencia* of, in *Surgery*, denotes a protrusion of a piece of the iris through a wound, or ulcerated opening in the cornea, after the escape of the aqueous humour. To this disease several writers have applied the name of staphyloma; though, in all probability, the influence of Scarpa will in future confine the latter term to a morbid thickening and projection of the cornea itself, a case which will be described in its proper place. See STAPHYLOMA.

The prolapsus of the iris is produced by such wounds and ulcers of the cornea as penetrate the anterior chamber of the aqueous humour, and sometimes by blows, which have been so violent as to rupture the transparent membrane investing the fore-part of the eye. If the lips of a wound of the cornea (as, for instance, those of the incision practised in the extraction of the cataract, or in opening an hypopium) are not immediately put into reciprocal contact, so as to keep the aqueous humour from running out of the anterior chamber, as fast as it is secreted, the iris, drawn by the current of this fluid towards the wound in the cornea, is urged between the lips of the incision, and, becoming elongated, projects upon the preceding membrane in the form of a small tumour. The same accident happens, when the globe of the eye receives a blow, or is too much compressed with a bandage, while a disunited wound of the cornea exists. In such a case, likewise, the prolapsus of the iris might be produced by a violent spasm of the muscles of the eye, excessive and long-continued vomiting, or repeated coughing. A prolapsus of the iris arises even more frequently from ulcers which extend through the cornea, than from wounds of that membrane; and Scarpa assigns as a reason for this fact, the loss of substance always attending the former cases. The little swelling must of course be of the same colour as the iris, namely, brown or grey; and its base is surrounded by a small opaque circle, formed by the cornea that has been for some time ulcerated or divided.

It seldom happens that more than one prolapsus of the iris presents itself in the same eye, since it does not often occur that the cornea is ulcerated or wounded in more than one place. However, we must not imagine that the iris is never protruded in several places at once: Scarpa has seen three distinct procidencie upon the same cornea, in consequence of three separate ulcers of that membrane.

Small as the tumour may be, (and, indeed, it is sometimes not larger than a fly's head,) it is nevertheless apt to give rise to very severe symptoms. Nor are we to wonder at this circumstance, as the iris is supplied with numerous blood-vessels and nervous filaments; and that part of it which is protruded must suffer excessive irritation, as well from the friction of the eye-lids, as from the action of the air, tears, and other matter upon it. Besides, it is a fact, that the projecting piece of the iris inflames and swells soon

after its protrusion, and consequently it suffers a great deal more from the compression and irritation. The patient at first complains of a pain like that of a thorn in the eye, and is also afterwards afflicted with an uneasy sensation of tightness or constriction of the organ. To these complaints are soon added an inflammation of the conjunctiva and eye-lids, a discharge of irritating tears, and an inability to bear the light. The protruded piece of the iris unavoidably drags towards it the rest of this membrane; and hence the shape of the pupil is changed from round to oval, and its situation undergoes an approximation to the wound or ulcer, through which the prolapsus of the iris has taken place.

When the disease has prevailed a considerable time, the intensity of the pain, inflammation, and other symptoms, is sometimes lessened, instead of increased. Scarpa informs us of such an example in a man, fifty years of age, who for ten weeks had had a prolapsus of the iris twice as large as a millet-seed. The patient bore the disease with the utmost indifference, being merely troubled with a slight chronic redness of the conjunctiva, and a difficulty in moving the eye ball with freedom. The little tumour felt to the finger hard, and almost callous.

In the treatment of this disease, some practitioners have recommended pushing the iris back again into its natural situation, by means of a whale-bone probe; and, in case of this being found difficult of accomplishment, they have advised the wound or ulcer of the cornea to be dilated as far as necessary, in the same manner as the stricture of a strangulated hernia is divided, for the purpose of enabling the surgeon to reduce the protruded bowels. Others have suggested irritating the projecting portion of the iris, in order to make it contract and return into its proper place again; and, with the same intention, it has been proposed to expose the eye suddenly to a very vivid light. The experienced and judicious Scarpa, however, sets down all these methods as ineffectual, if not dangerous; for, says he, admitting that we could, in any of these ways, replace the iris, without lacerating or hurting it, still there would continue in the wound or ulcer of the cornea an opening, through which the aqueous humour would escape, and carry out with it again a fold of the iris.

It cannot be denied that a prolapsus of the iris is a most unpleasant kind of accident; but yet, as we are utterly unpossessed of any means whereby we can stop the escape of the aqueous humour through certain wounds and ulcers of the cornea, we ought, according to Scarpa, to consider the prolapsus of the iris a beneficial occurrence, and preventive of the total destruction of the eye, inasmuch as the protruded fold of this membrane, acting like a plug, prevents the entire loss of the aqueous humour, which soon collects again in the anterior chamber, and hinders a further protrusion of the iris, by separating this membrane from the cornea, and re-establishing the equilibrium between it and the other humours of the eye. Hence Scarpa reprobates the foregoing plans as useless and dangerous.

The principles laid down by this eminent surgeon tend to establish two chief indications, in cases of recent prolapsus of the iris: one is to diminish the extreme sensibility of the piece of the iris projecting out of the cornea; the other is to effect a gradual destruction of the protruded portion of the iris, to such a depth as will render the wound or ulcer capable of healing, but not so deeply as to break the adhesion which the iris has contracted to the bottom of the breach in the cornea.

Both these indications may be fulfilled by touching the projecting part of the iris with the antimonium muriatum, or, with what is still preferable, the argentum nitratum.

An assistant, standing behind the patient's head, is to keep the upper eye-lid raised with Pellier's elevator; and the patient is to hold his eye as steady as possible, by fixing it on one object. While the assistant raises the upper eye-lid, the surgeon is to depress the lower one with the index and middle fingers of his left hand, and with his right touch the protruded piece of the iris with the argentum nitratum, cut in the shape of a crayon. The caustic should be pressed upon the centre of the little tumour, so as to form an eschar of the proper depth. The pain suffered at this instant is exceedingly severe; but it quickly subsides, as soon as the eye has been bathed with warm milk. The caustic expeditiously destroys the sensibility of the protruded part of the iris, and the eschar prevents the effects of the friction of the eye-lids, and hinders the air and tears from causing any irritation of the projecting portion of that membrane. Hence the pricking and painful tension, previously felt in the eye, are diminished; as likewise are the ophthalmia and secretion of scalding tears.

The benefit thus produced lasts only as long as the eschar continues adherent to the tumour formed by the iris. Immediately the slough is detached, all the annoying complaints again come on, though in a somewhat mitigated degree, in consequence of the projecting part of the iris not being quite so prominent as it was before the caustic was applied. The eschar frequently separates on the second or third day: but whenever it happens, the painful symptoms recur; and the surgeon's duty is to use the argentum nitratum again without delay. The application is in this way to be repeated, until the protruded part of the iris is destroyed so deeply, that it can no longer hinder the wound or ulcer of the cornea from healing.

The employment of the argentum nitratum must not be continued, after the prolapsus of the iris has been sufficiently depressed; as we learn from Scarpa, that such a plan would bring on all the pain and inflammation again in an aggravated form. When the little tumour has been levelled as much as the indication requires, the caustic is not to be applied again; and the surgeon is simply to introduce between the eye and eye-lids a collyrium, containing sulphate of zinc and mucilage of quince-seeds, and afterwards insinuate a small quantity of the following ointment under the eye-lids, every morning and evening:

R. Adipis suillæ ʒ ʒ 6.

Tutia ppt.

Bol. Armen. subtilissimæ pulv. ā ā ʒ ij.

Caleis hydrarg. alb. ʒ j. Misce.

This ointment must be at first weakened with twice or thrice its quantity of lard.

When the foregoing applications are not too stimulating, the ulcer is gradually diminished, and generally quite healed in about a fortnight.

As the union, which takes place in the course of the treatment, between the protruded piece of the iris and the internal edges of the wound, or ulcer, of the cornea, always continues after the cure is completed, the pupil must for ever remain of an oval shape, and a little inclined towards the cicatrix in the cornea. This must happen even when the treatment has been as successful as possible. It is pleasing, however, to learn from the experienced Scarpa, that such alteration in the situation and position of the pupil causes little or no diminution of the power of seeing the most minute objects, and occasions much less impairment of the sight than might be supposed, unless it unfortunately happen that the scar in the cornea is in the middle of it. Besides, we are also assured by the same distinguished surgeon,

that

that the power of discerning things is the less injured, inasmuch as the pupil, which was in the beginning of the disease narrow and oblong, becomes afterwards more capacious. This fact is likewise confirmed by Richter in his *Obs. Chir. fascicul. i. p. 85*.

Scarpa has found the preceding treatment more successful than any other, not excepting the method of cutting off the protruded part of the iris with a pair of scissors. This last plan, he thinks, is only advantageous when the iris is strongly adherent to the internal lips of the wound or ulcer of the cornea, or when the prolapsus has existed a long while, and the projecting portion of the iris has become indurated and callous, while its base, constricted by the edges of the wound, or ulcer of the cornea, not only adheres to them, but has put on the appearance of a kind of pedicle. Scarpa, indeed, has seen one instance, where the little tumour fell off of itself in consequence of the compression made upon its neck by the edges of the ulcer of the cornea.

IRIS, Imperforate. See *PUPIL, Closure of*.

IRIS, in *Botany*, ¹⁷¹⁵ of the ancient Greeks, so named from the various, and somewhat concentric, hues of the flower, which give an idea of the rainbow. The modern Greeks call it *ῥίσις*, and the Turks *susen*, both which words are synonymous with our *lily*, and the French *lis*, or *fleur-de-lis*—Linn. Gen. 27. Schreb. 36. Willd. Sp. Pl. v. 1. 224. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. ed. 2. v. 1. 115. Sm. Fl. Brit. 41. Juss. 57. Lamarck. Illustr. t. 33. Gærtn. t. 13.—Class and order, *Triandria Monogynia*. Nat. Ord. *Ensatæ*, Linn. *Iridæ*, Juss.

Gen. Ch. *Cal.* Spathas of two valves, separating the flowers, permanent. *Cor.* in six deep segments, united into a tube by their narrow bases; each oblong, obtuse; the three outermost reflexed, three inner erect and most acute. *Stam.* Filaments three, awl-shaped, lying on the reflexed segments of the corolla, and not half so long; anthers vertical, oblong, straight, depressed. *Pist.* Germen inferior, oblong; style simple, closely enclosed by the tube of the corolla; stigmas three, each with a petal-like, dilated, oblong appendage, keeled on the inside, furrowed at the outer, lying over each stamen, two-lipped, the lower lip small and notched, upper larger, cloven, slightly reflexed. *Peric.* Capsule oblong, angular, of three cells and three valves. *Seeds* several, large, more or less compressed and angular.

Eff. Ch. Corolla in six deep segments, alternately reflexed, superior. Stigmas with a petal-like two-lipped appendage.

Obf. Botanists have differed about the really efficient part of the stigmas of the *Iris*. The whole petal-like expansion was supposed by Linnæus and his followers to be the actual stigma, or at least they had no precise idea of the exclusive action of any particular part. The late Abbé Cavanilles conceived the pollen to be received into a tubular opening between the base of each stamen and the extremity of the style, and there to perform its office. Kölreuter and Sprengel, with much more probability, believe the upper or inner surface of the small lower lip of the petal-like expansion, which is glandular in that part, to be the real stigma, and the latter has curiously explained the mode in which bees convey the pollen to this spot. See Sims and König's *Annals of Botany*, v. 1. 412. The stigma of several species of *Moræa* comes very near that of *Iris*, and there has always been some ambiguity between these two genera, which we shall endeavour to remove when we come to *MORÆA*.

Iris is a large and very natural genus. Tournefort subdivided it into several by the roots, which in some species are tuberous, in others bulbous. Some moreover have the

upper surface of the reflexed segments of the corolla smooth, whilst in others that part is beautifully bearded.

In the *Species Plantarum* of Linnæus are 22 species; in Syst. Veg. ed. 14. twice that number, Thunberg, who wrote a dissertation on this genus, having greatly augmented it. Pallas discovered many new species in his Siberian travels. Willdenow has 54 in all. Mr. Ker differs from the latter in the arrangement of many of them, even Linnæan ones, which he removes to *Moræa*, and he is followed implicitly by Mr. Dryander in the new edition of the *Hortus Kewensis*. The whole are divided into four sections.

* *Root thick, solid, horizontal. Flowers beardless.*

Of this the common English *I. Pseud-acorus*, Engl. Bot. t. 578, less accurately figured in Curt. Lond. fasc. 3. t. 4, is an example. It grows in watery places, flowering in July, and like every known *Iris* is perennial. The flower is bright yellow, streaked with darker lines.

** *Root thick, solid, horizontal. Flowers bearded.*

To this section belong many of our garden kinds, as *I. fusiana*, Curt. Mag. t. 91, or Chalcædonian *Iris*, so remarkable for its large flower, elegantly pencilled with black: *I. cristata*, Sm. Spicil. t. 13, found in America; as well as the well-known *I. variegata*, *sambucina*, *florentina*, and *germanica*, natives of the south of Europe.

*** *Root knobby. Flowers beardless.*

This contains only *I. tuberosa*, Fl. Græc. Sibth. t. 41, Curt. Mag. t. 531, known by its quadrangular leaves and singularly dark flower.

**** *Root bulbous. Flowers beardless.*

Here are found the pretty *I. Xiphium*, Curt. Lond. t. 686, which decorates many a cottage garden with its sweet blue and yellow blossoms: *I. persica*, Curt. Mag. t. 1, more delicately coloured: and, to some persons, exquisitely scented, though to others it is scentless; and *I. Sisyrrinchium*, Fl. Græc. Sibth. t. 42. Redout. Liliac. t. 29. The last is referred by Mr. Ker to *Moræa*.

IRIS, in *Gardening*, contains plants of the fibrous, tuberose, and bulbous-rooted, showery, herbaceous, perennial kinds; of which the species cultivated are very numerous; but the following are some of the principal; the dwarf iris (*I. pumila*); the Chalcædonian iris (*I. fusiana*); the Florentine iris (*I. florentina*); the twice-flowering iris (*I. biflora*); the leafless iris (*I. aphylla*); the variegated iris (*I. variegata*); the German iris (*I. germanica*); the elder-scented iris (*I. sambucina*); the brown-flowered iris (*I. squalens*); the crested iris (*I. cristata*); the trisid-petalled iris (*I. tricuspidis*); the bulbous-rooted iris (*I. xiphium*); the common yellow, or water-iris (*I. pseud-acorus*); the stinking iris (*I. foetidissima*); the Virginian iris (*I. virginica*); the various-coloured iris (*I. versicolor*); the pale-yellow iris (*I. ochroleuca*); the spring iris (*I. verna*); the Persian iris (*I. persica*); the grass-leaved iris (*I. graminea*); the spurious iris (*I. spuria*); the Siberian iris (*I. sibirica*); the Martinico iris (*I. martinicensis*); the peacock iris (*I. pavonia*); and the snake's-head iris (*I. tuberosa*).

The first of these sorts has varieties with white flowers; with straw-coloured flowers; with pale-blue flowers; with blush-coloured flowers; with yellow variable flowers; and with blue variable flowers.

The ninth sort has likewise varieties with blue standards and purple falls; with pale-purple standards; with white standards; and with a smaller flower.

The eleventh species also varies greatly in the shape of the larger petals, as well as in the colours, as blue, purple, yellow, white, and spotted.

And the twelfth sort furnishes varieties with blue flowers; with violet-coloured flowers; with white flowers; with pur-

ple flowers; with yellow flowers; with blue standard petals and white falls; with blue standards and yellow falls; with striped flowers; the broad-leaved with blue flowers; the broad-leaved purple flowered; the sweet-scented blue flowered; the sweet-scented purple flowered, with variegated sweet-scented flowers, and the double flowered.

The nineteenth fort, or Persian iris, is greatly esteemed for the beauty and extreme sweetness of its flowers, as well as for its early appearance in the spring, being generally in perfection in February or the beginning of the following month, according to the state of the season. And Martyn notices that, "like the hyacinth and narcissus, it will blow within doors in a water-glass, but stronger in a small pot of sand, or sandy loam, and that a few flowers will scent a whole apartment."

Method of Culture.—Most of the forts may be readily increased by parting the roots, or separating the off-sets from the bulbs, and planting them out in the situations where they are to flower; the first fort in the autumn, or very early in the spring, and the latter in the close of summer, when the leaves decay, managing them in the same manner as other bulbs. As they increase and spread rapidly in their roots, they should be divided and taken off every two or three years.

New varieties of the different forts may be raised from seed, by sowing it in the autumn in a bed of light sandy mould. The plants come up in the following spring, and in the autumn may be transplanted where they are to grow. They flower a year or two afterwards in this climate.

The bulbous-rooted forts succeed best in such soils as are of the light, sandy, loamy kind; but will succeed in any that are dry.

The last fort answers most perfectly in such aspects as are towards the east, the roots being prevented from going too deep in the ground.

As the second fort is liable to be injured by severe winters, a few should be planted in pots to have protection. This fort is well suited for forcing, in houses for the purpose.

When planted in the open ground, it requires a rather dry soil and situation to succeed in a proper manner.

The Cape forts should be retained in the dry stove, and be propagated and managed in the same manner as other bulbous-rooted plants of the same kind.

All the forts are proper for affording variety in the borders, clumps, and other parts of pleasure grounds; and some of the more tender forts among potted plants of similar growth and habits.

Iris, in the *Materia Medica*. The *Iris florentina*, Florentine orris, or iris, is a native of Italy, and flowers in June; it was cultivated in England by Gerard in 1596, and is now constantly propagated by the florists; but the roots of the orris produced in this country have neither the odour, nor the other qualities of those of the warmer climates; so that for medicinal use they are commonly imported from Leghorn. In its recent state, the root is extremely acrid, and when chewed, excites a pungent heat in the mouth, of several hours' duration. When dried, this acrimony is almost wholly dissipated. The taste is slightly bitter, and the smell is agreeable, approaching to that of violets. No essential oil has been hitherto obtained from this root; but spirituous tinctures of it contain more of its virtues than watery infusions. The fresh root is a powerful cathartic, and for this purpose its juice has been employed in the dose of a dram and upwards in dropies. It is now chiefly used in its dry state, and ranked as a pectoral or expectorant; though there is no evidence of its expectorant powers; and therefore it is now

considered as valuable only for the pleasantness of the perfume, and the flavour which it communicates.

The *Iris pseud-acorus*, *palustris*, or *palustris lutea*, *Acorus adulterinus*, yellow water-flag, or yellow water flower-deluce, is common in marlles, and on the banks of rivers, and rendered very conspicuous by its large yellow flowers, which appear in the beginning of July. It had formerly a place in the Lond. Pharm. under the name of "*Gladiolus luteus*." The root has no smell, but an acrid styptic taste, and its juice, snuffed up the nostrils, produces a burning heat in the nose and mouth, accompanied with a copious discharge from these organs; and hence it is recommended both as an errhine and sialagogue. This root is such a powerful astringent, that it has been used instead of galls in the making of ink, particularly in Scotland. For this purpose the common people cut some of the roots into thin slices, and either boil or infuse them in water till the liquor is highly tinged with blue; they then pour it clear off: and putting into it the blade of a knife, or any other piece of iron, they rub it hard with a rough white pebble, common there, and by degrees the liquor becomes black: they continue rubbing it till it is as deep a black as they require, and it is a tolerable good ink. (Phil. Transf. N^o 117.) This root has also been used for the purpose of dyeing black; and from this quality it has been successfully employed as a medicine for the cure of diarrhœas. When given with this intention, the root is to be well dried; for the fresh root and its juice are strongly cathartic, inasmuch that eighty drops of the latter produced repeated evacuations, after jalap, gamboge, &c. had failed, and by continuing its use in an increased dose, it cured an inveterate dropy. Hence Bergius says, "*virtus recent. hydragoga, pungens: siccat. adstringens.*" The expressed juice is likewise said to be an useful application to serpiginous eruptions and scrophulous tumours. (Woodv. Med. Bot.) The root of this plant is recommended by Brookes as a remedy for the tooth-ache.

Iris, *Rainbow*, in *Physiology*. The word is Greek, *ἵρις*, supposed by some to be derived from *ἔειπεν*, *I speak, I tell*, as being a meteor, that is supposed to foretell, or rather to declare, rain. See RAINBOW.

Iris is also applied to those changeable colours which sometimes appear in the glasses of telescopes, microscopes, &c. so called from their similitude to a rainbow. The same appellation is also given to that coloured spectrum, which a triangular prismatic glass will project on a wall, when placed at a due angle in the sun-beams.

Iris is also a name given by some authors to a peculiar species of sprig crystal, remarkable for its giving the rainbow colours in reflection. This, however, being a property more or less found in all the kinds of sprig crystal, and these much resembling one another, it became applied to sprig crystal in general; and iris, instead of being the name of a peculiar species, was understood as a synonymous term for common crystal.

Iris Marina, the *Sea-rainbow*. This elegant appearance is generally seen after a violent storm, in which the sea-water has been in vast emotions. The celestial rainbow has great advantage over the marine one in the brightness and variety of the colours, and in their distinctness one from the other; for in the sea-rainbow there are scarcely any other colours than a dusky yellow on the part towards the sun, and a pale green on the opposite side. The other colours are not so bright or distinct as to be well determined, but the sea-rainbows are more frequent and more numerous than the others. It is not uncommon to see twenty or thirty of them at a time at noon-day. Observ. sur l'Asie, p. 292.

IRIS Plants, Petrified, in *Natural History*. In Dr. Grew's Catalogue of the Rarities of Gresham College, p. 274, he mentions a petrified iris-root; a stone somewhat flat, but radiated from the central pith, the polished end of which, when wetted, shewed these radiations very fine: this extraneous fossil probably belonged to the coralline tribe, instead of being a root. In Dr. Leigh's account of the fossil plants, found in the coal-pits at Burnley in Lancashire, he mentions iris: long narrow leaves, resembling those of flags, and so called in general, are common in coal strata; these kinds of leaves in the grit-stone quarries in Derbyshire are often called swords, from the resemblance of their impressions in the stone to the sheath of a sword.

IRISH SEA, in *Geography*, the name of that part of the Atlantic ocean, which is between the coasts of Ireland and Great Britain.

IRISH Terms. See **TERMS**.

IRKINEEVA, in *Geography*, a town of Russia, in the government of Tobolsk; 160 miles E.N.E. of Eniseisk. N. lat. 58° 50'. E. long. 96°.

IRKUTSK, a town of Russia, and capital of a government, to which it gives name, on the Angara, near the lake Baikal, the see of a Greek archbishop, and a place of considerable commerce; the caravans which trade to China passing through it. N. lat. 52° 4'. E. long. 95°.

IRKUTSKOI, a government of Russia, containing all that part of Siberia which lies beyond the 107th degree of east longitude; bounded on the N. by the Frozen sea, on the E. by the N. Pacific ocean, on the S. by Chinese Tartary, and on the W. by the governments of Kolivan and Tobolsk. It is the most extensive, but least populous of all the Russian governments, and is divided into the four provinces of Irkutsk, Nertchinsk, Yakutsk, and Ochotsk, so called from the four principal towns.

IRMA-HISSAR, a town of Asiatic Turkey, in Natio-
lia; 40 miles S.E. of Castamena.

IRNEE, a town of Hindooستان, in the circar of Mahur; 38 miles N. of Mahur.

IRNERIUS, in *Biography*, sometimes called Wernerius, a celebrated jurist of the twelfth century, was probably born at Bologna. He first taught philosophy in that city, and acquired much distinction by being the first who opened a school for lectures in the Roman law in Italy, after its interruption by the invasions of the barbarous nations. He also composed glosses upon the Roman law, not only upon the Code and Institutions, but upon the Digest. He obtained great reputation by his labours; and the name of Wer-
nerius, in a plea of the countess Matilda, in 1113, stands before that of any other of the lawyers. The same circumstance is found in the pleas of the emperor Henry IV. from the year 1116 to 1118, which proves that he attended the court of that monarch in his professional capacity. In 1118 he accompanied Henry to Rome, where he was employed to persuade the Romans to the election of the anti-pope Burdin. He died about the year 1150; and is said to have introduced the degree of doctor into the universities. Bayle.

IRON, *Eisen*, Germ. *Fer*, Fr. *Ferrum*, Lat. *Ferro*, Ital. *Jeren*, Swed. *Jernet*, Dan. *Vas*, Hung. *Hierro*, Span. *Jilazo*, Ruff. *Ferro*, Port. *Sidraço*, Gr. *ἱερὸν* (*Bharzel*, or *Varzel*), Heb. *Marr*, Alehem.

The use of this metal is of very high antiquity, though not so remote, there is reason to believe, as that of either gold, silver, or copper. The inferior brilliancy of its colour may, perhaps, in some degree, account for this circumstance;

as well as the greater skill required to obtain it from its ores, and convert it to the purposes of art. It is mentioned frequently in the pentateuch; and was, in the time of the celebrated writer of that history, employed for the fabrication of swords, knives, and various other sharp-edged instruments. We may form some estimate of the value that was then attached to it, from an expression in the eighth chapter of Deuteronomy, where Moses tells the Israelites, in his descriptive eulogy of the Land of Promise, that it is "a land whose stones are iron, and out of whose hills" they may "dig brass." A circumstance, illustrative of the same fact, at a later date, is furnished about 400 years subsequent to that period, when Achilles proposed a ball of iron as one of the prizes to be distributed to the victors at the games instituted in honour of Patroclus. (Il. ii. 202, &c.) The art of working it appears, in the course of a few succeeding centuries, to have arrived at considerable perfection; for, according to the information of Herodotus (Clio xxv.), a saucer of the metal, very curiously inlaid, was presented by Alyattes, king of Lydia, to the Delphic oracle, which, he says, "is of surprising workmanship, and as worthy of observation as any of the offerings preserved at Delphi." The durability of iron, and its indispensable assistance in the preparation of every other metal, make it one of the most valuable possessions that has been bequeathed to the use of civilized man. "Without it," observes Fourcroy, "agriculture could not have existed, nor could the plough have rendered the earth fertile. The philosopher, while he studies the progress of the human understanding, and compares the fortune and state of the different nations established on various portions of the surface of the globe, will remark, that their iron-works seem, in some measure, to be proportioned to their intelligence, to the advancement of reason amongst them, and the degree of perfection to which the arts have arrived. When we consider it in this point of view, as the agent by which men, in the variety of its uses, and the numerous wants it supplies, acquire enjoyments which would be unknown to them if they did not possess these products of their industry, iron must singularly contribute to extend their ideas, to multiply their knowledge, and to conduct their spirit towards that perfectibility, which nature has given no less, as the character of the human species, than as the source of all the advantages it can enjoy." Syft. vol. 6.

Iron is a malleable and ductile metal, of a blueish-white colour; is susceptible of a very high polish, and of the specific gravity, according to the tables of Muschenbroeck, Swedenburg, and Brisson, of from 7.600 to 7.895, and even 8.166. It is soluble in most acids, and precipitable from its combination with them, by various re-agents, which will be hereafter pointed out. With the Prussic acid it forms that beautiful pigment known in commerce, and the arts, by the name of *Prussian blue*; and in a variety of other ways, constitutes the basis of many valuable preparations. The combinations under which it is exhibited to us in nature are detailed in the following section.

§ 1. Ores of Iron.

Sp. 1. *Native iron*. *Gediegen-eisen*. *Fer natif*. *Ferrum nativum*.

Its colour is steel-grey, passing to silver-white. Occurs only in a ramose form; the masses alluded to by Brochant and others being now considered of meteoric origin. Surface glistening. Internally it is intermediate between glistening and glimmering; and its lustre metallic. Fracture hackly. It is rather soft, is completely malleable, and flexible without being elastic. Sp. gr. 7.8.

A spe

A specimen from a mine near Kamsdorf, in Saxony, yielded, according to Klaproth,

Iron	92.5
Lead	6.0
Copper	1.5
	<hr/>
	100.0

The varieties which contain nickel are meteoric.

It is found in detached masses, which are usually covered with an oxyd of a brownish colour.

The places of its occurrence are Kamsdorf and Eibens-Stock, in Saxony; Oulle, near Grenoble, in France; and some others.

Sp. 2. *Iron Pyrites. Schwebelkies. La Pyrite Sulfureuse. Ferrum Mineralisatum Pyrites.*

This very abundant mineral is divided by Werner into five subspecies, common, radiated, capillary, hepatic, and cellular.

Subsp. 1. *Common Pyrites.*—Colour bronze-yellow, passing sometimes to gold-yellow. Occurs massive and disseminated. It is very frequently also crystallized. Its forms are the cube, either perfect or truncated, the octahedron, dodecahedron, and sometimes, though very rarely, the icosa-hedron. The crystals are in general small; except the cube, which is middle-sized. Their surface is either smooth or streaked, and varies from glimmering to splendid. Internally it is shining or glistening; and its lustre metallic. Fracture even; sometimes conchoidal. It is hard, brittle, rather easily frangible, and heavy. Sp. gr. from 4.600 to 4.831.

Exposed to the blow-pipe, it exhales a strong odour of sulphur, and burns with a blueish flame. It afterwards passes into a globule, obedient to the magnet, of a brownish colour; and treated with glass of borax, communicates to it a tint of a dark dirty green. It appears to be composed of about 52.5 sulphur, and 47.5 iron.

Its occurrence is almost universal, both with reference to geographic arrangement, and the mineral formations in which it is presented.

Subsp. 2. *Radiated Pyrites.*—Colour bronze-yellow, of a paler hue than the preceding; passing sometimes to brass-yellow. Surface tarnished. Is found massive and reniform, also uniform, globular, and crystallized. The shape of its crystals is cubic, and octahedral; the latter being sometimes truncated on the angles. The external lustre varies between splendid and glistening. Internally it is glistening and glimmering. Fracture usually radiated; sometimes uneven and fibrous. Fragments uniform. Occurs in coarse and large-grained distinct concretions, also lamellated and columnar. It is hard, brittle, very easily frangible, and heavy, but less so than the foregoing subspecies. Emits a sulphureous odour when struck, or rubbed. Sp. gr. from 4.698 to 4.775.

Before the blow-pipe it exhibits the same appearances as common pyrites, and is constituted of about 54 parts of sulphur, and 46 of iron.

It is considerably rarer than the preceding, and is found in veins, particularly those which contain lead or silver.

The places of its occurrence are, amongst others, Cornwall and Derbyshire, in England; Arendal, in Norway; and in various districts of Suabia, Saxony, and Bohemia.

Subsp. 3. *Capillary Pyrites.*—Colour bronze-yellow, inclining more or less to steel-grey. Occurs in very fine capillary crystals. Lustre shining or glistening; metallic. Brittle, and in a small degree flexible. The smallness of its

crystals prevents a more particular account being given of its character.

Its chemical properties are the same as those of common pyrites.

It is never met with but in very small quantity, and is the most rare of all the varieties of pyritic iron. It is most usually accompanied with quartz, lead-glance, or galena, and fluor and calcareous spar.

Is found at Annaberg, Schneeberg, and Johanngeorgenstadt, in Saxony; at Andreasberg, in the Hartz; and other places on the continent of Europe. The capillary pyrites, according to Klaproth's analysis, is not an iron-ore, but nickel, mixed with a small portion of cobalt and arsenic.

Subsp. 4. *Hepatic Pyrites.*—Its colour is intermediate between bronze-yellow and steel-grey, passing sometimes entirely to the latter. On exposure, the fresh fracture changes to a brown. It is found massive, and under a variety of other forms, as stalactitic, cellular, &c. also crystallized. The shape of its crystalline arrangement is prismatic, pyramidal, and tabular, each with six sides. Lustre glimmering, inclining to glistening; metallic. Fracture even, passing sometimes to uneven and imperfectly conchoidal. Fragments indeterminate, sharp-edged. Hard, rather inclining to soft, brittle, easily frangible, and heavy.

This subspecies is said to contain arsenic. It decomposes very easily on exposure to air, which renders it very difficult to be retained in mineralogical collections.

It occurs only in veins, and in those principally which contain red silver ore, galena, blende, common pyrites, and sparry iron-stone. The earthy minerals that accompany it are, for the most part, quartz, sulphat of baryt, and calcareous and fluor spar.

It is found in Derbyshire; at Joachimsthal in Bohemia; Annaberg and Freyberg in Saxony; and in various parts of Sweden, Norway, and Siberia.

Subsp. 5. *Cellular Pyrites.*—Colour bronze-yellow, a good deal inclining to steel-grey. Tarnishes by exposure, and then becomes of a grey tint. Occurs massive; but its most common appearance is cellular. Cells drusy on the surface. Lustre glistening. Fracture conchoidal. Fragments sharp-edged, indeterminate. Brittle, and in a slight degree flexible.

Its occurrence is in veins, where it is accompanied, according to the statement of professor Jamieson, with hepatic and common pyrites, lead-glance, sparry iron-stone, nickel, iron-ochre, brown-spar, heavy-spar, fluor-spar, and quartz.

Is found at Johanngeorgenstadt, in the electorate of Saxony.

Sp. 3. *Magnetic Pyrites. Magnetkies. La Pyrite magnetique. Ferrum mineralisatum magnetico-pyritaceum.*

Colour copper-red, inclining much to bronze-yellow, and even to pinchbeck-brown. Tarnishes on exposure, becoming then brown. Occurs massive and disseminated: has never been found under any other form. Internal lustre glistening, or shining; metallic. Fracture uneven, and sometimes imperfectly conchoidal: when the latter, it has a lustre bordering on splendid. Fragments indeterminate, rather blunt-edged. Intermediate between hard and semihard. It is brittle, easily frangible, and very heavy. Is attracted by the magnet. Sp. gr. 4.516.

Treated by the blow-pipe, it emits a slight sulphureous odour, and melts with great facility into a greyish-black globule, which is attracted by the magnet, and colours borax black. It is composed of 36.5 sulphur, and 63.5 iron.

It occurs only in the class of rocks denominated primitive; and there only in beds. The minerals which usually accompany

accompany it are galena, magnetic iron-stone, arsenical pyrites and tin-stone; with also quartz, garnet, strahlstein, hornblende, &c.

Its geographic distribution is rather extensive. Amongst many other instances, the following may be enumerated: Moel Elion, in Caernarvonshire, North Wales; Geyer, Breitenbrunn, &c. in Saxony; Bodenmais, in Bavaria; and in different parts of Norway and Siberia.

Sp. 4. *Magnetic Iron-stone. Magneteisenstein. Le fer magnetique. Ferrum magnes.*

Werner divides this into two subspecies; namely, common magnetic iron-stone, and magnetic iron-sand.

Subsp. 1. — *Magnetic Iron-stone.*—Colour iron-black, inclining sometimes to perfect black, and sometimes to steel-grey. Occurs massive, disseminated and crystallized. The form of its crystals is the cube, perfect or truncated; the octahedron, which is also sometimes varied by truncation; the garnet dodecahedron, and the rectangular four-sided prism, terminated by four planes, placed on the lateral edges, as in the hyacinth. These crystals vary much in size. The dodecahedrons and octahedrons have their faces smooth; but the planes of the four-sided prism are transversely streaked. Lustre externally shining; internally varying from glimmering to splendid. Fracture small and fine-grained, uneven, approaching sometimes to small conchoidal, and imperfect foliated. Fragments indeterminate, rather sharp-edged. Occurs sometimes in granular distinct concretions. It is semi-hard, passing to hard; brittle; when in crystals difficultly frangible, and heavy. Sp. gr. 4.200 to 4.939. It is attracted by the magnet; and is itself also magnetic.

Before the blow-pipe it becomes brown, and imparts a dark-green colour to borax. It is supposed to be an oxyd of iron, nearly in a state of complete purity.

This species is very common in primitive mountains, especially in those of gneiss and micaceous schistus. In these situations it arranges itself in beds; but sometimes composes the entire mass of distinct mountains. The Sletz, or secondary formations, as they are termed, are not free from it. It occurs in greenstone at Taberg; in hornblende in Smoland, and in basalt near Eisenach. It is usually associated with common hornblende, garnet, and granular limestone. Sometimes with actinote, albist, &c.; but is most frequently found in the vicinity of magnetic pyrites, arsenical and copper pyrites, and common pyrites.

It is found in one of the Shetland isles; in Bohemia, Hungary, Saxony, Italy, France, Switzerland, Siberia, and South America. Is very abundant in Sweden, where it is employed for the manufacture of the iron imported to this country for the supply of the Sheffield market.

Subsp. 2. *Iron-sand.*—Colour deep iron-black, which passes sometimes to ash-grey. Occurs in angular or roundish grains; and also in small octahedral crystals. Surface rough and feebly glimmering. Internal lustre shining, metallic. Fracture perfect conchoidal. Fragments indeterminate, sharp-edged. Streak greyish-black. Semi-hard, brittle, easily frangible, and heavy. Sp. gr. 4.600. Strongly attracted by the magnet.

Its chemical characters are as the foregoing subspecies.

It occurs in the beds of rivers; and also imbedded in the rocks of basalt and wacke.

Is met with in the river Elbe, near Schandau, in Saxony; imbedded in float-trap, in Bohemia; and is found also at St. Domingo, Guadaloupe, in Norway, France, the Tyrol, Greenland, &c.

Sp. 5. *Iron-glance. Eisenglanz. Le fer speculaire. Ferrum mineralisatum speculare.*

This is also divided into two subspecies; common iron glance, and micaceous iron-ore, or, as it is called by professor Jamieson, iron-mica.

Subsp. 1. *Common Iron-glance.*—Colour steel-grey of greater or less intensity, and sometimes reddish. It occasionally passes into iron-black. Surface very often tarnished, and beautifully iridescent. Occurs massive, disseminated, and crystallized. The form of its crystals is various. The most common is the rhomboidal parallelepipedon; the cube, formed by the truncation of a double three-sided pyramid, and having three triangular faces instead of two of its angles opposite, and octagonal plates bounded by linear trapeziums, six in number, inclined alternately to different sides. Planes of the crystals sometimes smooth, and sometimes streaked. Externally it varies from glimmering to splendid; internally from glistering to splendid; lustre metallic. Fracture compact and foliated. The compact varieties are uneven, and sometimes small conchoidal. The foliated have a fourfold rectangular cleavage. Fragments octahedral or pyramidal; sometimes indeterminate. Edges rather blunt. Generally unseparated. Gives a deep cherry-red streak. It is hard, opaque, brittle, more or less easily frangible, and heavy. Sp. gr. 5.0116 to 5.218. It is magnetic, but less so than the preceding species.

Before the blow-pipe it is infusible, alone; but becomes white when heated on charcoal; and yields a dirty yellow-coloured scoria, with borax. Stated by Kirwan to contain from 60 to 80 per cent. of iron.

This species appears to be confined to primitive, and the class called transition mountains. It has never been found in those of secondary formation. Its occurrence is in beds and veins, where it is usually accompanied with magnetic iron-stone, common pyrites, compact red iron-stone, hornstone, and quartz.

Sweden yields it very abundantly; as also does Norway. Some of the finest specimens are from the isle of Elba, where the ore is said to have been worked for upwards of three thousand years. It occurs in Bohemia, Saxony, Switzerland, France, England (in Lancashire and Cumberland), Hungary, South America, Siberia, &c.

The English specimens occur in cavities in compact red iron-stone. The crystals are usually small; and the lustre of their surface is particularly splendid.

Subsp. 2. *Iron-mica.*—Colour iron-black, passing sometimes to steel-grey, and sometimes to deep-red. The latter is rather the colour of it, when held under the form of thin plates, between the eye and the light. Occurs massive, disseminated, and crystallized. When the latter, it appears in thin tables with six sides. Surface smooth and splendid. Internally it is also splendid, and its lustre metallic. Fracture perfect curved foliated; cleavage simple. Fragments sometimes indeterminate, and sometimes tabular. The massive varieties occur in granular distinct concretions. Thin plates of it are translucent. Its streak is deep cherry-red. It is semi-hard, brittle, very easily frangible, and heavy. Sp. gr. 4.50 to 5.07.

Before the blow-pipe it exhibits the same appearances as the preceding subspecies, except in communicating an olive-green tinge to borax. The proportion of iron which it yields is from 70 to 80 per cent.

It is exclusively confined to primitive mountains, and for the most part to those of a newer formation. It is found, like iron-glance, in beds and veins, and is accompanied with other ores of the metal: calcareous and fluor spar, quartz, hornstone, &c.

Its geographic distribution is rather extensive. It occurs near Dunkeld, in Perthshire; at Dartmoor, in Devonshire;

in one of the Shetland isles; in Norway, Sweden, Russia, France, isle of Elba, and many districts of Germany.

Sp. 6. *Red Iron-stone. Roth-eisen-stein. La mine de fer rouge. Ferrum ochraceum rubrum.*

Werner has divided this into four subspecies, which professor Jamieson, in conformity with the principles of the Wernerian nomenclature, has denominated red iron-froth, ochry-red iron-stone, compact red iron-stone, and red hematite.

Subsp. 1. *Red Iron-froth.*—Colour deep cherry-red, sometimes blood-red and brownish-red, and even inclining to steel-grey. Usually friable. Occurs sometimes massive and disseminated; and is composed of scaly parts which soil considerably. Lustre between glimmering and glitening; semi-metallic. Is greasy to the touch, and moderately heavy.

Exposed to the blow-pipe alone, it blackens without melting, and communicates a bright green colour to borax. According to Haüy, it is constituted of

Iron	66.
Oxygen	28.5
Silex	4.25
Alumine	1.25

100.

It occurs generally in veins in primitive and transition mountains, accompanied with other ores of iron, copper pyrites, quartz, barytic spar, &c.

Although a rare variety of this metal, it is found rather plentifully in the neighbourhood of Ulverstone, Lancashire, and is also met with in Cornwall. It occurs too in Norway, the Hartz, Saxony, Silesia, Salzburg, Hungary, and South America.

Subsp. 2. *Ochry-red Iron-stone, or Red Ochre.*—Colour varies between blood-red and brownish-red. Occurs sometimes massive and disseminated, sometimes superficial, or coating other ores of the metal, but most usually friable. Lustre faintly glimmering, or dull. Fracture earthy. Fragments indeterminate, blunt-edged. Feels meagre. Soils more or less strongly. Is not very brittle. Easily frangible, and rather heavy. Sp. gr. 2.952.

It is rarely found alone; being generally accompanied with other species of iron-ore, and particularly with compact red iron-stone, and red hematite. It occurs in veins; and is distributed nearly as the two following subspecies.

Subsp. 3. *Compact red Iron-stone.*—Colour between brownish-red and dark steel-grey, passing sometimes to blood-red. Occurs massive, disseminated, and in various imitative forms, as reniform, cellular, &c. It is sometimes found crystallized, and appears either in cubes, or four-sided pyramids, the latter of which are truncated on their summits. The cube is found both perfect and truncated. Surface of the cubes smooth; of the pyramids rough and dull. Internal lustre between glimmering and dull; semi-metallic. Fracture for the most part even. It sometimes, however, passes into coarse-grained, uneven, and large conchoidal. Fragments indeterminate, rather sharp-edged. Streak blood-red. Between hard and semi-hard. Somewhat brittle, and more or less easily frangible, heavy. Sp. gr. 3.423 to 3.76.

It assumes a darker colour before the blow-pipe; but is infusible, even with the assistance of borax. This re-agent, however, is tinged of a yellowish-green by it.

Occurs in beds and veins with red hematite and the pre-

ceding subspecies; and is also accompanied with quartz, red-jasper, and hornstone.

It is found very abundantly in Lancashire; in the Hartz, Saxony, Bohemia, Heflia, Siberia, and France.

It is frequently smelted in this country; and principally in those works which fabricate the variety of iron described in the succeeding part of this article, under the name of *forge-pig*. The richer ores, in fact, are incapable of yielding the most highly carbonized descriptions of iron; partly, perhaps, because they contain too little earthy matter to afford a sufficiently plentiful cinder; and partly because their reduction is too immediate.

Subsp. 4. *Red Hematite.*—Colour intermediate between brownish-red and steel-grey; passing sometimes intirely into one or other of them, and even into blood-red. It is from the latter variety that the name of hematite (from *αἷμα, sanguis*.) is derived. Occurs massive and reniform; also stalactitic, globular, uniform, &c. External surface rough and glimmering. Internally glitening, passing into glimmering; lustre semi-metallic. Fracture always fibrous. Fragments usually wedge-shaped; sometimes splintery and indeterminate. In angulo-granular distinct concretions. Streak a bright blood-red. Hard, inclining to semi-hard. Rather difficultly frangible. Brittle, and very heavy. Sp. gr. 4.74 to 5.005.

It exhibits the same chemical characters as the foregoing subspecies, and yields in the large way about 60 per cent. of metal.

According to the recent analysis of M. D'Aubuisson, who has published a very interesting memoir in the 75th volume of the "*Annales de Chimie*," on the chemical constitution of certain iron ores which appear to have water as an essential ingredient, this mineral is composed of

Peroxyd of iron	-	90
Silex	-	2
Lime	-	1
Volatile matter	-	3
Loss	-	4
		100

The specific gravity of the specimens here submitted to examination was 4.8. Another specimen, the specific gravity of which was 5.0, yielded the following result:

Peroxyd of iron	-	94
Silex	-	2
Water	-	2
Loss	-	2
		100

Each of the above presented a trace of manganese, and the latter a similar evidence of lime.

Its geognostic situation is similar to the last.

Lancashire yields it very plentifully, as well as the neighbouring parts of Cumberland. It is found, too, in considerable abundance in Saxony; and in Bohemia, France, Silesia, the Hartz, Siberia, &c.

It is one of the most common varieties of iron ore, and is very frequently employed in the smelting furnace.

Sp. 7. *Brown Iron-stone. Brown Eisen-stein. La mine de fer brune. Ferrum ochraceum brunum.*

This, like the preceding, is divided into four subspecies, which have the same leading distinctions. They consist of brown iron-froth, ochry-brown iron-stone, compact brown iron-stone, and brown hematite.

Subsp.

Subsp. 1. *Brown Iron-froth*.—Colour varying between clove-brown and steel-grey. Occurs massive, superficial, and frothy. Is composed of scaly particles, which are glistening, and have a metallic lustre. Fragments indeterminate, blunt-edged. Intermediate between friable and solid. Soils strongly. Feels greasy to the touch. Is very soft, light, and sometimes even swimming.

It blackens before the blow-pipe without melting, and communicates a yellowish-green colour to borax.

It is generally found coating compact brown iron-stone, and brown hematite.

One of the Shetland islands affords it; and it occurs also in Saxony, the Hartz, Norway, Carinthia, Bareuth, Carniola, and Stiria.

Subsp. 2. *Ochry-brown Iron-stone*.—Colour yellowish-brown, inclining to ochre yellow. Occurs massive and disseminated. Between solid and friable. Fracture earthy. Internally it is dull. Fragments indeterminate, blunt-edged. Soils considerably. Is more or less coherent, and heavy.

Imparts an olive-green colour to borax.

It accompanies the other subspecies; and is found in Norway, Saxony, Bohemia, Bavaria, and Salzburg.

Subsp. 3. *Compact Brown Iron-stone*.—Colour clove-brown of various intensities, passing sometimes to yellowish-brown. Occurs massive, disseminated, and in various imitative forms, as stalactitic, reniform, cellular, dendritic, &c. It sometimes, also, appears in pseudo-crystals, of which the cube, rhomb, and lens have been particularized. Madrepores and corallines, too, have it frequently for their base; as well as other extraneous fossils. Internally it is dull, or very rarely glimmering. Fracture usually even, sometimes earthy and small-grained uneven, and conchoidal. Fragments indeterminate, edges more or less blunt. Streak bright yellowish-brown, bordering on ochre-yellow. Is semi-hard, inclining to hard. Rather brittle. Easily frangible, and heavy. Sp. gr. 3.4771 to 3.551.

It darkens before the blow-pipe, in consequence of the loss of oxygen, and becomes magnetic. Borax receives an olive-green colour from it.

The proportion of its ingredients, as stated by M. D'Aubuisson, in the 75th volume of the "Annales de Chimie," is as follows:

	From Bergzabern.	From Vicdessos.	From Voightberg.
Peroxyd of iron -	84	81	69
Peroxyd of manganese -	1		3
Silex -	2	4	10
Alumina -			3
Volatile matter -	11	12	13
Loss -	2	3	2
	<hr/> 100	<hr/> 100	<hr/> 100

The specific gravity of the specimen from Vicdessos was 3.4.

It is always accompanied with some of the other subspecies; and frequently with quartz, calcareous and heavy spar, and pyrites.

Occurs in Mainland, one of the Shetland isles; the Hartz, Saxony, Silesia, Bohemia, Suabia, the Tyrol, France, Carinthia, &c.

Subsp. 4. *Brown Hematite*.—Its colour, internally, is clove-brown, which passes to yellowish-brown, and brownish-black. It is exhibited under a great variety of other shades, as blueish or iron-black, pinchback-brown, bronze-yellow, and sometimes iridescent. Occurs rarely massive; usually in some

of the imitative forms before spoken of. It is sometimes found in pseudo-crystals of a pyramidal shape, with six acute-angled sides. Surface sometimes smooth, and sometimes rough and drusy. Lustre shining or glistening. Internally it is from glimmering to glistening; intermediate between silky and resinous. Fracture fibrous, passing sometimes to small conchoidal. Fragments usually splintery or wedge-shaped; rarely indeterminate. Occurs in distinct concretions. Streak yellowish-brown. Opaque. Semi-hard. Brittle. Very easily frangible, and heavy. Sp. gr. 3.789 to 3.951.

It blackens before the blow-pipe, but does not melt. With borax it enters into ebullition, and produces a dirty yellow-coloured compound.

Its constituent parts, according to M. D'Aubuisson, whose analyses were generally repeated two or three times, are as below stated:

	From Bergzabern.	From Vicdessos.
Peroxyd of iron -	79	82
Peroxyd of manganese -	2	2
Silex -	3	1
Volatile matter -	15	14
Loss -	1	1
	<hr/> 100	<hr/> 100

The specific gravity of the former was 3.8, and of the latter 3.9. The specimen from Vicdessos afforded a slight trace of alumina.

It occurs in the newest primitive, transition, and secondary mountains; but most frequently in the two latter, where it is found lining cavities in veins or beds. Its usual attendants are black and sparry iron-stone, calcareous spar, brown and heavy-spar, and sometimes, though rarely, quartz.

It is found in Voightland, the Fichtelgebirge, Franconia, Hesse, and Nassau.

This species, which is so very abundantly distributed in the German states, is of rare occurrence either in Sweden, Russia, Norway, or England. In the former, it furnishes materials for very extensive iron-works; and the wrought-iron produced from it is very valuable.

Sp. 8. *Sparry iron-stone*. *Spath-eisstein*. *Le fer spatique*. *Ferrum ochraceum spatiforme*.

Colour yellowish-grey, which passes into yellowish-brown, clove-brown, and blackish-brown. It tarnishes on exposure either to the air or heat, and then becomes brown or black, and sometimes iridescent. Occurs massive, disseminated, and crystallized. Its crystals are either rhombs, lenses, octahedrons, or garnet-dodecahedrons. They are seldom large or very small; commonly middle-sized and small. Their surface is sometimes smooth, sometimes drusy, and a little rough. Internally it varies from splendid to glimmering; lustre pearly. Fracture foliated. Cleavage triple. Fragments rhomboidal. Occurs in granular distinct concretions. The light-coloured varieties are translucent, especially on the edges; but the dark-coloured opaque. The former give a greyish-white streak; the latter a yellowish-brown. It is semi-hard, inclining sometimes to soft. Rather brittle. Easily frangible, and moderately heavy. Sp. gr. 3.300 to 3.810.

It blackens before the blow-pipe, and enters into ebullition with borax, to which it communicates a dirty yellow colour. It always effervesces more or less with acids. According to Bergmann, it is composed of

3 I Oxyd

Oxyd of iron	-	38
Oxyd of manganese	-	24
Lime	-	19
Carbonic acid	-	10
Water	-	9
		<hr/>
		100
		<hr/>

but it is liable to great variation in the proportion of its ingredients. In a recent examination by Collet-Descoitels, the following result was afforded :

Fragments of quartz	-	2.58
Red oxyd of iron	-	48.45
Brown oxyd of manganese	-	1.80
Lime	-	.52
Magnesia	-	1.98
Carbonic acid, water, and loss	-	44.67
		<hr/>
		100.
		<hr/>

Annales de Chimie, t. 58.

The specific gravity of the specimen analysed in this case was 3.693 ; and its colour was brownish-yellow.

It occurs in primitive and secondary mountains ; in the former, in veins ; in the latter, in beds.

It is found sparingly in Britain ; and not very abundantly in Sweden, Norway, Switzerland, Siberia, Bohemia, and Saxony. At Schmalkalden, in Hesse, however, there is a bed from 25 to 30 fathoms thick ; and in different parts of Westphalia, Stiria, Carinthia, &c. it is very plentiful. A whole hill, in the province of Biscay, is composed of it, which is said to have been worked for several thousand years.

It is much used as an ore of iron, and the metal produced from it is considered to be peculiarly favourable for steel-making ; but whether this is any thing more than a mere prejudice, seems greatly to be questioned.

Sp. 9. *Black iron-stone.* *Schwarz eisenstein.* *La mine de fer noire.* *Ferrum ochraceum nigrum.*

This is divided into two sub-species ; compact black iron-stone, and black hematite.

Subsp. 1. *Compact Black Iron-stone* — Colour between bluish-black, and dark steel-grey. Occurs massive, and in various imitative forms. Surface dull, or faintly glimmering. Internally it is bordering on glistening, and its lustre semi-metallic. Fracture commonly conchoidal, sometimes uneven. Fragments indeterminate, sharp-edged. Streak shining, but unchanged. It is semi-hard, brittle, easily frangible, and heavy. Sp. gr. 4.076, according to Wiedemann.

This mineral had for a long time been classed as an ore of manganese, and was removed to the present genus from some particular distinctions that were pointed out by Werner, between the compact grey manganese ore, of which it had usually been considered a variety, and the sub-species now under examination. M. D'Aubuisson, however, in the course of his late researches, has subjected a specimen of it to chemical analysis ; and instead of finding iron to be its principal ingredient, has ascertained it to be almost wholly composed of manganese and silex. This would, perhaps, be a sufficient authority for transferring it to the latter genus again ; but as the Wernerian classification has been uniformly adhered to in the present article, it has been deemed best to continue its enumeration here, and accompany the account of it with the particulars of M. D'Aubuisson's inquiry.

The specimen he examined came from Raschau, in Saxony, and was of a bluish-black colour mixed with grey. It had

a compact fracture, was semi-hard, approaching to hard, and of the specific gravity of 3.6. It consisted of

Peroxyd of manganese	-	64
Silex	-	13
Volatile matter	-	14
Loss (occasioned by an accident in drying some carbonat of manganese on the filter)	-	9
		<hr/>
		100
		<hr/>

Annales de Chimie, t. 75.

Considerable difference is very likely to exist in the chemical constitution of this mineral, and the total absence of iron, in the present case, may certainly be regarded as rather an extraordinary circumstance. Indeed, Werner's judgment is much too accurate to admit the supposition, that the varieties which have come under his inspection were destitute of it ; but from the very great produce of manganese in the above analysis, and the general character of the species, in imparting a violet-blue colour to borax, there can be little doubt that this, if not both sub-species of black iron-stone, are, properly, ores of the former metal.

Subsp. 2. *Black Hematite*. — Colour inclining more to steel-grey than the preceding sub-species. Occurs massive and reniform. Internally it is glimmering ; lustre semi-metallic. Fracture delicately fibrous, passing into even. Fragments wedge-shaped. Occurs in granular distinct concretions. In other respects agrees with the preceding.

Before the blow-pipe, both the members of this species melt with borax into a violet-blue coloured glass. No exact analysis has yet been made of the black hematite ; but its chemical constitution is in all probability very much similar to that of the former sub-species.

Black iron-stone is found in primitive and flint mountains, accompanied with brown and sparry iron-stone and quartz.

It occurs at Naila, in Bareuth ; Raschau, in Saxony ; Hesse, the Upper Palatinate, and the Hartz.

Sp. 10. *Clay iron-stone.* *Thoneisenstein.* *Le fer argileux.* *Ferrum ochraceum argillaceum.*

This widely distributed, and highly valuable mineral, is divided into seven sub-species ; reddle, columnar clay iron-stone, lenticular clay iron-stone, jaspery clay iron-stone, common clay iron-stone, iron kidney, or kidney-shaped iron-ore, and pea ore, or pea-shaped iron-ore.

Subsp. 1. *Reddle*. — Colour light brownish-red. Occurs only massive. Principal fracture slaty, glimmering. Cross fracture earthy, dull. Fragments tabular, splintery or indeterminate. Streak lighter than the fracture surface, and more shining. Soils strongly, and may be written with. It is soft, and very soft, sectile, easily frangible ; strongly adherent to the tongue, meagre to the touch, and moderately heavy. Sp. gr. 3.1391 to 3.931.

It decrepitates and blackens at a red heat, and, in a more elevated temperature, melts into a kind of pumice of a greenish-grey colour.

It most generally occurs in the newer clay slate ; and is found in Thuringia, Saxony, Silesia, Salzburg, Hesse, and Siberia.

It is scarcely used for any other purpose than drawing.

Subsp. 2. *Columnar Clay Iron-stone*. — Colour brownish-red, passing sometimes to cherry-red. Occurs massive, and in pieces which are more or less angular. Surface rough and dull. Internally dull, and fracture earthy. It most usually occurs in columnar distinct concretions. Streak blood-red. It is soft, very easily frangible, brittle, meagre to the touch, adheres slightly to the tongue, and is moderately heavy.

It

It blackens before the blow-pipe, and imparts an olive-green colour to borax.

It is but rarely met with, and appears to be, in some instances, of pseudo-volcanic origin. Its occurrence with porcelain jasper, and other minerals which are evidently of that class, gives considerable colour to the idea; but there are cases, as the one observed by Reufs in Bohemia, where it appeared in the centre of a mountain of clay-slate, that are equally opposite in their evidence.

It is found in the isle of Arran, at Sobrusan, Hofchnitz, Delau, and near Prohn, in Bohemia; at Dutweiler, in Saarbrücken; and Amberg, in the Upper Palatinate.

It yields too small a proportion of metal, even where the mineral is sufficiently abundant, to be at all worked as an ore of iron.

Subsp. 3. *Lenticular Clay Iron-stone*.—Colour brownish-red, varying to reddish and yellowish-brown, and greyish-black. Occurs massive. Internally it is strongly glimmering, sometimes glitening, and always semi-metallic. Fracture fine earthy, and sometimes slaty. Fragments indeterminate, blunt-edged. Occurs in distinct concretions, which are frequently lenticular, but sometimes granular. The streak varies with the colour of the specimen: generally lighter. It is usually soft, sometimes very soft, and semi-hard. Secile, inclining to brittle; very easily frangible, and heavy.

Its composition, according to Lampadius, is

Of oxyd of iron	64.
Alumine	23.
Silex	7.5
Water	5.
Loss	.5
	<hr/> 100

The black varieties, which occur only in the canton of Berne, are said to yield 90 *per cent.* of iron. The red ore, which is found very abundantly in Bohemia, affords 60 *per cent.*

It is distributed in transition and fletz mountains, and generally unmixd with other minerals.

Besides the situations already noticed, it is met with in Suabia, the Netherlands, Bavaria, Franconia, and France.

It is smelted as an ore of iron, and the brown varieties of it, which contain from 30 to 35 *per cent.* of metal, are much valued on account of the excellent quality of the metal that is produced from them.

Subsp. 4. *Jaspersy Clay Iron-stone*.—Colour brownish-red. Occurs massive. Internal lustre dull, bordering on glimmering. Fracture flat conchoidal; sometimes even. Fragments rhomboidal, also cubic and trapezoidal. Lighter in the streak. Soft, brittle, easily frangible, and heavy.

It has, hitherto, been only met with in a bed which belongs to the secondary or fletz formation, between Vienna and Hungary.

Subsp. 5. *Common Clay Iron-stone*.—Colour light yellowish-grey, inclining to ash-grey, and passing into blueish and steel-grey, yellowish, reddish, and clove-brown, brick-red, and brownish-red. These colours, particularly the lighter ones, undergo a change on exposure to the air, generally becoming darker. Occurs massive, and in a variety of extraneous forms, especially of shells and vegetables. Internally it is dull. Fracture earthy, sometimes conchoidal and slaty. Fragments indeterminate, blunt-edged; soft; rather brittle; adheres a little to the tongue; is more or less easily frangible; meagre to the touch, and heavy. Sp. gr. from 2.936 to 3.471.

Explored alone before the blow-pipe it blackens, but does

not melt. With borax it enters into a fort of ebullition, and produces a glass of a blackish olive-green colour. It varies considerably in the proportion of its ingredients. Some specimens of the mineral yield as much as 40 *per cent.* of oxyd of iron, whilst others do not afford more than 20 *per cent.*, and many even less than that. The following, which will contribute to shew this, are the results of some analyses by Richter and Lampadius.

Oxyd of iron	20.1	33.9	39.	42.5
Oxyd of manganese	1.	1.1		3.
Silex	19.9	23.9	5.	13.8
Alumine	30.2	13.	40.	13.6
Magnesia			6.	
Carbonic acid	28.3	28.1		27.1
Water			9.	
Sulphur			1.	
	<hr/> 100	<hr/> 100	<hr/> 100	<hr/> 100

This subspecies is a very abundant one, and occurs in beds in the secondary or fletz formation.

It is found very plentifully in different parts of England and Scotland; and is also met with in Westphalia, Bohemia, Silesia, the Upper Palatinate, Poland, Russia, Siberia, Italy, and Norway.

Subsp. 6. *Reniform iron ore*.—Colour yellowish-brown, varying in intensity in the same specimen. The centre is the lightest, and not unfrequently includes a small kernel of an ochre-yellow tint. Occurs in masses from the size of a walnut to that of a man's head, which are most commonly imbedded in clay or shale. Fractured towards the surface, even; in the interior fine earthy. Fragments indeterminate, rather sharp-edged. Internal lustre dull; externally glimmering, semi-metallic. It is composed of concentric, lamellar, distinct concretions, inclosing a nodule, which is often loose. Surface rough; external layers soft; those of the centre very soft; brittle; easily frangible; adheres to the tongue; is meagre to the touch, and moderately heavy. Sp. gr. 2.574.

It does not melt before the blow-pipe, when heated alone; but enters into fusion with borax, and communicates to it a dirty yellow colour.

Occurs in the newest fletz rocks, imbedded in the argillaceous strata that are incumbent on coal.

It is found abundantly in Derbyshire, and some of the neighbouring counties; in Scotland, Norway, Denmark, Bohemia, Silesia, Transylvania, France, and Siberia.

The greatest proportion of the iron manufactured in the midland districts of England, as well as in many parts of Scotland, is obtained from the two foregoing subspecies. The metal which they afford, too, is, generally speaking, of the best quality. This is principally referable to the liberal supply of earthy matter in their composition; for, without a sufficient production of scoria, or cinder, in the blast-furnace, the highly carbonized, and consequently most valuable, varieties of iron cannot be formed. These subjects will be more fully discussed in a succeeding section of the article.

Subsp. 7. *Pisiform iron-stone*.—Colour yellowish-brown, of different shades, passing sometimes to blackish-brown. This is its internal appearance. Externally, it varies according to the nature of the stratum in which it is imbedded, being reddish, yellowish, and liver-brown, and even yellowish-grey. Occurs in small spherical grains; Centre of the grain dull; lustre increasing towards the surface to glitening. Internal fracture fine earthy; externally, even. Fragments indeterminate, somewhat sharp-edged.

edged. Occurs in concentric, lamellar, distinct concretions. Streak yellowish-brown. It is semi-hard, passing to soft. Not very brittle; easily frangible. Sp. gr. 5.207.

It exhibits, before the blow-pipe, the same appearances as the last subspecies. Subjoined are the results of two analyses of it; the former by Vauquelin, the latter by Mallinghof:

Iron	30	45
Oxygen	18	15
Alumina	31	13
Silex	15	12
Water	6	15
	<hr/> 100	<hr/> 100

This mineral is supposed by Werner to occur in the second stetz lime-stone, and in clay-beds.

It is found in France, Switzerland, Franconia, Hesse, Suabia, the duchy of Wirtemberg, and Dalmatia. In the latter country, it is said to be used by the inhabitants instead of shot.

The greater part of the French iron is extracted from this subspecies. It yields, in the large way, from 30 to 40 per cent. of metal.

Sp. 11. *Bog iron ore. Raseisenstein. Le fer limoneux. Ferrum ochraceum cespitium.*

Werner divides this into three subspecies; morass ore, swamp ore, and meadow ore.

Subsp. 1. *Morass ore.*—Colour yellowish-brown. It is sometimes friable, and sometimes approaching to coherent. When the latter, it occurs massive, corroded, and in grains. The former varieties consist of dusty particles. Lustre dull. Fracture earthy. Fragments indeterminate, blunt-edged. Soils considerably. Is meagre to the touch, and light.

Subsp. 2. *Swamp ore.*—Colour dark yellowish-brown, sometimes passing to yellowish-grey. Occurs corroded, vesicular, and amorphous. Lustre dull, sometimes slightly glimmering. Fracture earthy, passing to fine-grained, uneven. Fragments indeterminate, blunt-edged. Streak light yellowish-brown. Very soft; sectile. Easily frangible, and moderately heavy. Sp. gr. 2.944.

Subsp. 3. *Meadow ore.*—Colour, when fresh broken, blackish-brown, passing sometimes to yellowish-brown, and brownish-black. Occurs massive, in grains, tuberosely perforated, and amorphous. Externally it is rough and dull. In the interior it varies from shining to glimmering; lustre resinous. Fracture conchoidal, passing sometimes to small-grained, uneven, and earthy. The conchoidal varieties have the brightest lustre. Fragments indeterminate, blunt-edged. Streak light yellowish-brown. Soft; brittle. Very easily frangible, and heavy.

Bog-iron ore in general blackens before the blow-pipe, without melting. It enters into ebullition with borax, and produces a glass of a dirtyish yellow colour. The only member of the species that appears to have been subjected to analysis is the meadow ore: and it is constituted, according to the information of M. D'Aubuisson, of

Peroxyd of iron	61
Peroxyd of manganese	7
Silex	6
Alumina	2
Volatile matter	19
Phosphoric acid	2.5
Lime, sulphur, and loss	2.5
	<hr/> 100

Annales de Chimie, t. 75.

The volatile matter, which so constantly forms a part of the results quoted from this chemist, almost exclusively consists of water; and it was with a view, indeed, of ascertaining the proportion of this ingredient, that his analytical labours were principally commenced. He supposes it to be an essential constituent of the different minerals he has examined, and proposes to arrange them under the class of *hydrates*.

The present species is melted in some of the countries that afford it, and yields, in the large way, from 30 to 35 per cent. of metal.

It occurs in the newest formations, and is conceived to be continually deposited in marshy places, from the evaporation of the water that has held it in solution. The preceding subspecies are products of this process at different stages; and the order in which they are arranged is indicative of the date of their formation.

It is found in different parts of the Highlands of Scotland, the Hebrides, Orkneys, and the Shetland islands. Poland and Prussia contain considerable quantities of it; as also do Brandenburg, Courland, Livonia, and Lithuania. Its occurrence is more frequent in the northern than in the southern countries of Europe.

Sp. 12. *Blue iron earth. Blaue eisererde. Le fer terreux bleu. Ferrum ochraceum caruleum.*

Before it has been exposed to the air, its colour is greyish-white, but afterwards becomes indigo-blue of different shades, and sometimes smalt-blue. Occurs massive, and disseminated; and is composed of dull, dusty particles, which are friable and cohering. Soils slightly. Feels meagre, and is moderately heavy.

Before the blow-pipe, it becomes of a reddish-brown, and afterwards melts into a brilliant black globule, which tinges borax of a deep yellow. It is readily soluble in acids. Bergmann had supposed it to be a native *Prussian-blue*; and it has received a place in many mineralogical systems, under that name, from the same belief: but an analytical examination of it by Klaproth seems to prove it to be a compound of phosphat of iron and alumina.

It occurs in nests in clay-beds, amongst bog-iron ore, and incrusting turf and peat.

It is found, under the latter circumstances, in the Shetland islands; it also appears in Iceland, Saxony, Silesia, Swabia, Bavaria, Poland, Siberia, Russia, and Sweden.

Sp. 13. *Pitchy iron ore. Eisenpecherez. Fer phosphaté.*

Colour pitch-black, passing sometimes into blackish-brown, and even deep reddish-brown. Occurs massive. Surface earthy, and dull. Internally it is glistering; lustre resinous. Fracture foliated, conchoidal, and sometimes fine-grained, uneven. Fragments indeterminate, tolerably sharp-edged. Opaque; semi-hard; brittle. Not very easily frangible, and moderately heavy. Sp. gr. 3.956.

It melts easily before the blow-pipe, and forms a black enamel. According to Vauquelin, it consists of

Phosphoric acid	27
Oxyd of iron	31
Oxyd of manganese	42
	<hr/> 100

Is found near Limoges, in France.

Sp. 14. *Green iron earth. Grüne eisererde. Le fer terreux vert. Ferrum ochraceum viride.*

This is divided into two subspecies; friable green iron earth, and coherent green iron earth.

Subsp. 1. *Friable green iron earth.*—Colour fawn-green. Occurs massive, and disseminated; and consists of particles which

which are without lustre. Fragments indeterminate; soils; is soft, and very soft. Sometimes friable. Meagre to the touch. Easily frangible, and moderately heavy.

Subsp. 2. *Coherent green iron earth*.—Colour rather darker than the last subspecies. Occurs massive, and corroded. Internally dull. Fracture fine earthy, passing into even, and sometimes into splintery. Fragments indeterminate; soft. Rather brittle, and inclining to heavy.

Before the blow-pipe, it becomes first red, and then of a dark brown; but does not melt. It tinges borax of a yellow colour, inclining to olive-green. No exact analysis has been made of this species; but it is supposed by Werner to have iron and phosphoric acid for its principal ingredients.

It is a rare mineral, and has hitherto been only found at Braunsdorf and Schneiberg, in Saxony, where it occurs in veins: in the former place, accompanied with quartz and pyrites; and in the latter, with quartz and native bismuth.

Sp. 15. *Cube-ore. Wurfelerz. Fer arseniat.*

Colour olive-green, of different degrees of intensity. Occurs massive, disseminated, and crystallized in small and very small cubes, which are sometimes flattened and truncated at the angles. Planes of the crystals smooth and splendid. Internally it is glistening, and its lustre between pearly and adamantine. Fracture imperfect foliated. Fragments indeterminate. Occurs in granular distinct concretions. It is translucent; soft; brittle, and gives a streak of a straw-yellow colour. Sp. gr. 3.000. It appears sometimes in the form of a reddish-yellow powder, which is thinly distributed over the surface.

Before the blow-pipe it swells up, and emits an arsenical odour; melting afterwards into a grey metallic globule, slightly tinged with yellow. From the analysis of Chenevix, it appears to be composed of

Arsenic acid	-	-	31.
Oxyd of iron	-	-	45.5
Oxyd of copper	-	-	9.
Silex	-	-	4.
Water of crystallization	-	-	10.5
			100

It occurs in veins, accompanied with some ores of copper, quartz, mica, and feldspar.

The only places that have, hitherto, afforded it, are the mines of Carrarach and Muttrell, in Cornwall.

Until the account published of this mineral by the count de Bournon, and Mr. Chenevix, in the Philosophical Transactions for 1801, it was mistaken for an arseniat of copper.

§ 2. *Assay and Analysis.*

Since the metal contained in every ore is of so much greater specific gravity than any other of its accompanying ingredients, it will be easy to form a tolerable idea of the value of an iron-ore by the weight of a given bulk.

Previously to working any iron-ore it should be very minutely analysed, both in the humid and dry way. By the humid process we shall ascertain the exact proportions of its constituents, without which it would be a mere work of chance to attempt to extract the iron in the metallic form.

When we are acquainted with the nature of the earthy matter in combination with the ore, we know with the greatest certainty what substances we ought to add in the crucible, for the purpose of eliminating the metal. All such substances are called fluxes, merely because they form fusible

compounds with the earthy matter of the mineral. It is to this treatment of a small quantity of the ore that we give the name of assaying.

The process by which the component parts are ascertained, consists in subjecting a small quantity of the ore in fine powder to the action of an acid, and sometimes to an alkali. By this means the whole is dissolved, and the different materials of which it is composed are separately precipitated by different chemical re-agents. The process, however, varies considerably with the nature of the ore to be examined.

Iron ores, as subjects of analysis, are divided into three heads; namely, sulphurets, oxyds, and salts.

The first are distinguished by their general bronze colour, but more particularly by the suffocating smell of sulphureous acid gas, which they afford by being heated to redness in the open air. The second consist of iron united with oxygen, and are by far the most common of all. Nearly the whole of the iron-ores in use are of this kind, containing also different proportions of earthy matter in their composition.

The third division comprehends such as consist of the oxyd of iron combined with some acid, and hence are called salts. The principal varieties of these are the phosphats, sulphats, arseniats, and carbonats.

The apparatus employed in the humid analysis will be a lamp fitted up with different-sized sliding-bearers, a silver crucible, and small portable furnace, with a sand-bath, and one of water, for drying precipitates; capsules of glass and porcelain; precipitating glasses, funnels, and filtering paper. For reducing the ore to powder, a mortar of hardened steel will be first necessary, and afterwards one of agate, to grind it very fine. Accurate weights and scales will be highly requisite, with cups of silver or platina.

The re-agents wanted will be sulphuric, muriatic, and nitric acids. Pure potash, soda, and borax, in the solid form. Solutions of the same, and also the pure aqua ammonia. The fully saturated carbonats of all the alkalis, and the subcarbonats of the same. The triple prussiat of potash and iron; and, when merely used as a test, prussiat of lime will answer. The analyst should, also, have in his possession powders or solutions of all the separate substances of which the mineral is supposed to consist, for the purpose of comparing real results with those obtained in his experiments.

If the ore to be analysed be a pure sulphuret, 100 grains, or any other given weight, may be reduced to powder, observing to weigh it after the operation, to see if any of the mortar has been abraded, which, when the ore is very hard, is to be expected; and the increased weight must in that case be noted down.

Let this powder be boiled with nitric acid in a long narrow-beaked glass vessel, which should be very thin at the bottom, to avoid cracking. By this method the sulphur of the ore will be converted into sulphuric acid; part of the nitric acid will be decomposed, and most of the remainder fly off, so that the resulting fluid will principally consist of the iron dissolved in sulphuric acid.

To this solution add the muriat of barytes, till a precipitation ceases to take place. When the precipitate has subsided, and the fluid is become perfectly clear, gently pour off the liquor, which is a solution now of iron in the muriatic acid. Let the precipitate, consisting of sulphat of barytes, be repeatedly washed with hot distilled water, till the liquid gives no precipitate with nitrat of silver, and afterwards add the washings to the fluid first poured off. After this white powder has been dried on the steam-bath, which is an apparatus constructed for this particular use, let it be weighed, and for every 100 grains of the substance allow 21.3 of sulphur. To the liquid parts which contain the oxyd of iron,

add

add a clear solution of the sub-carbonat of potash. Let it boil for a little time, and the oxyd of iron will subside. Wash it and dry it as above, afterwards weighing the product. The quantity of oxygen in the oxyd of iron thus obtained, may be known by the quantity of iron obtained from it in the process of assaying, which we shall afterwards give. If the ore consist of oxygen and iron only, it may, without any previous treatment, be referred to the dry process. When, however, earthy matter is combined with it, the humid analysis should be resorted to, which requires a different mode of proceeding to that already given.

Let 100 grains of the ore be reduced to a fine powder, as above directed, observing to weigh it afterwards, for the purpose of ascertaining whether any of the materials of the mortar be mixed with it. The matter so added, if it be acquired from the agate mortar, may be deemed pure filex.

To this powder add 300 grains of dry potash, in a silver crucible, capable of holding about six or seven ounces. Pour to the mixture a very little water, just sufficient to moisten the whole. Apply a gentle heat in the first instance, to prevent the mass from swelling too much, and gradually increase the temperature till the crucible is red-hot. The mass will now be in a state of fusion more or less perfect, according to the quantity of filex contained in the ore. If, from a great proportion of alumine being present, the fusion should be very imperfect, more potash must be added, and the heat continued and raised as high as the crucible will bear. When the crucible, with its contents, are sufficiently cooled, let both together be put into a capsule of porcelain, and nearly filled with distilled water. The whole should then be set upon a sand-bath, and boiled for some time, taking care to stir it very frequently. This will detach the matter adhering to the crucible, and if any filex remain unacted upon, it will be dissolved by the potash.

Let the whole be now saturated with muriatic acid, and even added a little in excess; and then gently boiled till all the liquid is evaporated. During this, the mixture must be constantly stirred; and particularly at the time the mass is becoming dry.

To this residuum let a large quantity of distilled water be poured. All the substances soluble in the acid will be now taken up. If it contain filex that will be left at the bottom. Let the whole be decanted into a narrow tall glass vessel, to suffer the filex to subside. Carefully pour off the clear liquor, and then add fresh hot distilled water, and continue to do so till the fluid does not cause a precipitate with nitrat of silver; observing to save all the washings which are acted upon by that test. The remaining water may now be evaporated from the filex, and the powder, being heated red-hot in a crucible of silver or platina, should be then weighed. If it be pure, it will be of a delicate white colour, not adhering to the fingers, as is the case with some of the other earths.

The solution containing the remaining substances should be evaporated to as small a quantity as possible, so that the fluid remain liquid and clear. To this let a saturated solution of the subcarbonat of potash be added, and afterwards boiled a few minutes. By this means, the whole of the ingredients will be precipitated together, and when all of them have perfectly subsided, decant off the liquor, repeatedly washing it with hot water. The first decanted liquor, with the washings, may be thrown away. Lastly, evaporate the remaining water, till the solid matter is of a pulpy consistence. To this, in a capsule of good porcelain, add a solution of pure potash. The alumine will be thus dissolved, while all the other substances will remain un-

touched. Let this fluid be poured off, and fresh water mingled with it, to take away all the alumine. Then, to the mixture containing the alumine, add not only as much acid as will saturate the potash, but also a quantity sufficient to dissolve the alumine, when the liquid will be quite clear. Finally, to this pour in carbonat of ammonia, till no more precipitate falls down. The precipitate, when washed and dried as above directed, and heated to redness in a silver crucible, may be considered as pure alumine.

The residuum from which the alumine was last taken is now to be dissolved in sulphuric acid, diluted with a large quantity of water, the acid being slightly in excess. This solution may contain magnesia, iron, and probably manganese. If lime were present, it will be left insoluble at the bottom of the vessel, in the state of sulphat of lime. The small portion of this substance dissolved by the fluid, may be precipitated by the addition of alcohol. The powder, when collected and dried at a dull red heat, must be weighed; allowing for every 100 parts 42 of pure lime. The solution from which the lime was separated, must next be saturated with a solution of the neutral carbonat of potash. In a few minutes the iron will be precipitated in the state of oxyd, while the magnesia and manganese will be dissolved by the carbonic acid. The iron must be separated, dried, and weighed. If with the solution containing the magnesia and manganese a solution of hydrosulphuret of potash be mingled, the latter will be precipitated in the form of a sulphuret; and this being washed and heated till the sulphur is driven off, the oxyd of manganese will be left in sufficient purity.

The magnesia still held in solution may be precipitated by adding a sufficient quantity of pure potash. The product must be heated to redness, and weighed. The weights of the different substances being added together, will, if great care has been used, be within one or two *per cent.* of the quantity originally submitted to experiment. If the deficiency be considerable, some mistake must have been made, and it will be necessary to repeat the analysis.

In the examination of salts of iron, nothing more is requisite than to disengage the acid with which the iron is combined. The arseniat of iron, for example, must be boiled with potash, which will separate the arsenic acid, and leave the oxyd of iron but very little acted upon. The arsenic acid may be afterwards precipitated by nitrat of lead; allowing for every 100 parts of the arseniat of lead, when dried, 33 parts of arsenic acid.

If the ore be a pure carbonat, to 100 grains in powder, add an equal quantity of sulphuric acid, in a glass vessel which can be placed over a lamp. Heat the mixture for some time, stirring it with a glass rod. The carbonic acid will be thus expelled, and its quantity will be indicated by the loss of weight sustained. Care should, of course, be taken that the heat be not too great, otherwise the evaporation of fluid matter may create error in the experiment. The iron may be afterwards treated as in the analysis of the earthy ores, and its quantity ascertained, by the methods there described. Having learned the exact proportions of the ingredients united in the ore, we may, with some degree of certainty, proceed to the assay by the crucible and fluxes. If the ore consist of oxyd of iron simply, nothing more is necessary than to introduce it into a crucible with about half its weight of charcoal powder, and any substance susceptible of vitrification, so as to keep off the air. This may be either pounded glass, or equal parts of lime and clay. But perhaps the best substance that can be employed, is the most fusible part of the blast furnace cinder, which is the least coloured with oxyd of iron. This may be employed in quantity amounting

amounting to about half the weight of the mineral to be assayed.

The earthy iron ore must be treated according to the result of the humid analysis; such earth being added as a flux, as will make the most fusible compound with that found by analysis to be present. The carbonaceous matter may be from $\frac{1}{4}$ to $\frac{1}{2}$ the weight of oxyd of iron.

The furnace best calculated for these experiments is called an assay furnace, and is capable of producing a great heat. See FURNACE.

The crucibles should be very small, not capable of holding more than three fluid ounces; and they should be provided with covers turned to them in a lathe before they are burned. The assay may be deemed finished when the whole is in a state of fusion, and the metallic button separated, which, being weighed, will give the *per centage* of iron in the ore.

§ 3. *Reduction of Ores, and Manufacture of Pig-iron.*

Although iron in its pure state is almost an infusible substance, it is capable of assuming the liquid form, by being combined with other matter. With sulphur it forms a fusible mass, of which we shall treat hereafter. It is also rendered fusible at a temperature something higher than that required to melt copper, by being combined with about $\frac{1}{4}$ th of its weight of carbon. It is to this compound in different proportions that the name of pig-iron is given, and it is so denominated, because it is cast into masses of a semi-cylindrical shape, called *pigs*.

The fusibility of this compound of iron and carbon, enables us to extract the metal from the ore to the greatest advantage. It is now common, particularly in our own country, to obtain the iron in this form, previous to making it into bar, or malleable iron. Formerly cast metal was not much in use, except for the manufacture of bar-iron and steel; while in the present day, a much greater proportion of it is consumed in that state than in any other; and the majority of our furnaces, too, are solely employed for this branch of manufacture.

The process by which pig-iron is obtained from the different iron ores is called *smelting*; and the furnaces employed for the purpose are called *smelting*, or *blast furnaces*. See BLAST FURNACE, and BLOWING.

The ores of iron require different treatment in the smelting process, according to the quantity of heterogeneous matter with which the metal is combined.

In all the ores the iron is in the state of oxyd, and would at least require a strong heat in contact with combustible matter for their reduction. In most, the oxyd of iron is combined with a considerable proportion of earthy matter, and they are then denominated *iron-stones*. These may be generally divided into two classes; the one called argillaceous, from abounding with excess of alumine, or clay; and the other calcareous, from lime being their principal earthy constituent. The former of these iron-stones is by far the most abundant in this country.

But, besides the earthy matter and oxygen in this class of metallic minerals, many of them contain sulphur, which is doubtless combined with the iron in the state of pyrites. Arsenic and manganese are also sometimes united with them. Of the above, the arsenic and sulphur are extricated, previously to smelting, by the process called *roasting*. For this purpose, the stone is stratified with refuse pit coal, and burnt in large heaps in the open air. The heat is sufficient to dissipate the greatest part of the above volatile materials, leaving behind the earth and oxyd of iron; and also the manganese, when the ore abounds with that metal.

In the process of smelting, two things are absolutely essential to the separation of the iron. First, the metal itself must be rendered fluid, which will then, by its great specific gravity, descend to the lowest parts of the furnace, and some other compound must, at the same time, be eliminated in a liquid form, so as to float upon its surface, and defend it from the influence of the blast. If the ore consisted of iron and oxygen alone, the carbon of the coke would combine with the oxygen; and an excess of carbon would also unite with the iron to render it liquid at that temperature; but here would be a deficiency of the fluid vitreous matter necessary to the defence of the iron from the oxygen of the blast. Hence it will be necessary to employ some substance with such iron-ore, which shall be capable of forming a liquid scoria, or cinder, for the preservation of the carburated iron when once obtained. So far as observation has dictated, it would seem that the cinder cannot be too perfectly fluid. The principles on which the fusibility of the cinder depends, are not simply confined to the materials used in the smelting of iron, but refer to all compound fusible matter with which we are acquainted. It may be observed, in general, and, indeed, almost without exception, that the fusibility of an alloy of two metals is fusible at a temperature much less than the arithmetical mean between the fusing points of the metals themselves. For instance, an alloy of lead and tin is more fusible than either of the metals composing it, and a similar mixture of copper and silver may be used as a solder for either silver or copper separately. This property is not less conspicuous in the earths. None of them in their *pure* state can be fused in our hottest furnaces; nor scarcely with a stream of oxygen gas; although certain proportions of them are, together, fusible at the heat of a moderate air-furnace. Lime and clay, when separately taken, may be considered as incapable of fusion at any degree of heat, yet produced in furnaces; and still, in certain proportions, they are too fusible to be made into even bricks or crucibles. It will appear, from these facts, that the iron-master cannot pay too much attention to the subject of the relative fusibility of the earths in different proportions. Most of the iron-ores of this country are argillaceous; that is, consist, besides oxyd of iron, of a small quantity of siliceous or flint, and a large proportion of clay. Limestone has always been employed for such ores, and, by combining with the clay and flint, as well as with a small portion of the oxyd of iron, forms a scoria or cinder, easily capable of fusion. Since, however, the proportions of these earths in the ore cannot be uniform, the quantity of limestone to be added ought to vary according to circumstances. We may hence infer, that if the fusibility of the cinder depends upon the particular proportions of the earths present, the iron-maker ought to possess a very perfect knowledge of the relative fusibility of different combinations of these bodies, and being at the same time aware of the component parts of the ore to be reduced, he will not be at a loss what should be added in the furnace, for the purpose of producing the most fusible cinder. But it will be proper here to observe, that the earths present, however accurate may be their proportions, will not of themselves form a cinder of sufficient fusibility, without the united aid of the oxyd of iron. This fact will be very familiar to those who have had experience in the use of fire-bricks. Clays which are free from that ingredient do not burn of a red colour; and hence the white appearance of fire-bricks is a tolerable test of their goodness. But those, on the contrary, which exhibit a redness on being fired, are easily fused, and unfit, consequently, to be used in those situations which are exposed to great heat. The proportions of lime, clay, and oxyd of iron, necessary to constitute the most fusible compound,

pound, has not, as we have yet heard, been directly ascertained by experiment. An inquiry, undertaken with this view, would, however, be of great importance to the iron-matter. It might be effected in two ways; first, by mixing different proportions of the materials employed; and, secondly, by a direct analysis of the most fusible part of the blast-furnace cinder, and that with which the best and most carbonated iron has been produced. The cinder which fuses at the lowest temperature will be best known by its fracture after cooling. It may, in general, be deemed good in proportion to its earthiness when solid, and particularly should the outer crust appear glassy and transparent. A reason may be given for this appearance, by reference to some facts announced by sir James Hall and Dr. Hope, in accounting for the opacity of the whin-stone. They found that when common flint-glass, which is more fusible than the blast-furnace cinder, was allowed to cool slowly, the mass became opaque, and put on a stony appearance. They hence concluded, that the whin-stone might have been transparent, and have possessed a glassy fracture, had it been cooled rapidly. The inference to be drawn from this will be obvious; for the more fusible the cinder, the longer it is in cooling, and consequently the more opaque. What strengthens this idea, too, is, that the exterior of a mass of cinder is more transparent, almost constantly, than the interior; and the centre of that in particular, under which the best iron is made, having a stony fracture, with a thin vitreous shell surrounding its outside. In beginning to work any new ore of iron, the first step is to analyse it, both in the dry and humid way. By the first, we get the *per centage* of iron in the ore; and by the second, we become acquainted with the quality and proportions of its earthy matter. The next step is to analyse the coal to be employed, for the purpose of ascertaining the quantity of carbon it contains, and also the nature and proportions of its earthy residua. These facts being clearly made out, there will be nothing necessary but to add to these materials a proper mixture of such substance as will make the most fusible cinder. If the ore be argillaceous, or, in other words, if clay predominate, lime is to be the material employed. Indeed, ores of this description are so very common, that lime has been thought the only substance to be used, under all circumstances, for the purposes of a flux; and so completely ignorant have the iron-makers been of the philosophy of the process, that it has even been attempted to be added when the ore has already abounded with calcareous ingredients.

Keeping in view the principles we have just laid down, the management of the calcareous ore will be equally easy with the mode of working the argillaceous; since, in such case, we have only to employ clay for the flux instead of lime. But the best method would, perhaps, be, if the component parts of an argillaceous and a calcareous ore were sufficiently well known, to mix the two together in proper proportions.

Whatever may be the substance employed, whether it be limestone for an argillaceous ore, or clay for a calcareous ore, it should be very minutely analysed, as those substances are scarcely ever found in a state of purity. The lime should, if possible, be the shell limestone. At all events, the magnesian stratum should be avoided, since that substance tends much to lessen the fusibility of earthy compounds. Some substances, to which we give the name of clay, frequently consist of a large proportion of some other earth.

Another thing to be attended to, also, is the state of oxidation in which we find the iron-ore.

If it be highly oxydated, more of the carbonaceous matter will be required for its reduction, and in all probability a

longer time; but, besides this, a greater quantity of the oxyd of iron will combine with the earthy matter, which, although it may contribute to the fusibility of the cinder, a large portion of the iron will be lost. On the contrary, when the iron is in a low state of oxydation, the whole of the iron may be apt to combine with the carbon, and the earthy matter may not get a sufficient quantity of the oxyd to render it, in a proper degree, fusible. In such case, it would be necessary to add some oxyd of iron, which might more easily vitrify and enter into the composition of the cinder.

The coal employed in the smelting of iron, for the purpose of being coked, is commonly laid in heaps in the open air, and afterwards set on fire. When the combustion has gone on to a certain degree, the fire is checked by covering it with dust and preventing all possible access of air. For farther particulars, see COKE.

It is essential that the coke should be harder than it can generally be made in the open air without considerable waste; and we recommend, therefore, the method employed in making the cokes for melting steel. The coal, which is very soft, is piled up in ovens of the shape of an erect frustum of a cone. The air is let in at an aperture near to the bottom, which is contracted in size as the combustion becomes rapid, and ultimately closed. The whole mass will at this time have acquired such a degree of heat, as not only to drive off all the volatile matter, but to render the coke extremely hard. There is a considerable saving in this mode of coking, and the coke is not only more compact, but better adapted for the generality of ores of iron.

In smelting the argillaceous ore, the proportions of the roasted ore, and the limestone, are governed entirely by the coke employed. The latter is always a fixed quantity, and the ore and limestone are varied according to the quality of the iron to be made and the working order of the furnace. In proportion as more or less of lime and ore are added to the standard quantity of coke, the furnace is said to carry a greater or less burthen.

It would be useless to give any precise proportions of the ore and limestone to a given quantity of the fuel, since they are found to vary with the nature of the coal in use; and, what is not a little remarkable, the proportions will frequently vary in two furnaces working with the same coal, and even in the same furnace at different times.

The burthen of the furnace will also vary with the quality of iron to be made, that is, as it is required to contain more or less carbon. In making the dark-grey iron called N 1, and which contains the greatest proportion of carbon, the burthen must be less than that required to make the less carburetted iron, commonly called white iron, or *forge-pig*.

To give a general idea of the proportions of the materials, we shall present in detail, the quantities used at a blast-furnace, making in general good melting iron, which is of an intermediate quality between N 1 and the *forge-pig*. The ore is argillaceous, containing about 27 *per cent.* of iron; the coal rather soft, but having a good proportion of carbonaceous matter; and the limestone good, being of the shell kind before spoken of. The furnace is about 45 feet high, and 12½ feet diameter in the widest part. It works with a bright *tuyere*, and receives from the blast about 2500 cubic feet of air in a minute, through a circular aperture of 2¼ inches in diameter.

The average charges of coke per *shift*, as it is termed, or in the space of 12 hours, are 50 (each 2¼ *cwt.*), or nearly seven tons. The calcined ore for good melting iron is about the same quantity, and for *forge-pig*, or the least carburetted variety,

variety, six of coke to seven of ore. The limestone unburnt, under the same circumstances, is to coke as four to eleven; and, for melting metal, retains a similar ratio. With the above charge per day, that is, for 12 hours, this furnace makes on the average about 40 tons of melting iron per week.

Some furnaces carry so little burthen as not to yield more than 13 or 14 tons weekly; whilst others, particularly in South Wales, produce, with the same sized furnace, as much as 60 and even 70 tons in an equal time. The burthen of these furnaces is very great, the ore to the coke being in some cases as 13 to 7; and the quality of the iron is uniformly inferior. Since the cavity in the furnace is constantly kept full of the above materials, it may easily be conceived that the whole must be in many intermediate stages, from the fully melted iron to the unchanged ore. At the point where the greatest heat is produced, which will be a little above the level of the blast, every thing capable of fusion will be assuming the liquid form. We cannot, however, for a moment suppose, that the iron at this point is in a state of oxyd, since it would of necessity be all vitrified, and enter into the composition of the cinder. If the iron, even in its carburetted form, were to remain long at so great a temperature, and within the influence of so much oxygen, it would first lose all its carbon, and ultimately pass into the state of vitreous oxyd. As, however, the oxygen of the blast rises in the furnace, it comes in contact with the carbon of the coke, and is very soon converted into carbonic acid gas. That point in the furnace, therefore, where the whole of the oxygen has entered into combination with carbon, may be denominated the commencement of cementation, or the point where the oxyd of iron is first deprived of oxygen, and ultimately saturated or *cemented*, as it is termed, with carbon. From this point to the top of the furnace the process of cementation is going on with different degrees of rapidity, proportionate to the temperature. It is found by experiment, that if a piece of iron-ore, particularly any of the oxyds that contain but little earthy matter, be exposed in a close vessel in contact with carbon, it will first lose the whole of its oxygen, and afterwards become so saturated with carbon, as to be capable of fusing into the best pig-iron. Hence it appears that the reduction of the ore, so far as relates to the deoxygenation and carbonization of the iron, may take place at a temperature below fusion, and without the mass of ore changing its form. The ore exposed to the carbonaceous matter in the cementing part of the furnace, must as completely undergo a similar change as if it were in the closest vessel; for the oxygen is excluded by the presence of carbonic acid gas. When the carbonized, but yet solid, iron, in the form of the ore, falls below the cementing point, or perhaps short of that, it begins to fuse. The earthy matter of the ore, being in contact with lime, begins also to assume the liquid form; and whilst the melted metal is exposed to the oxygen of the blast, a small portion of oxyd of iron is produced, which will enter into the composition of the cinder, and thus tend to increase its fusibility. The liquid iron now drops into the chamber of the furnace called the *hearth*; and the liquid cinder, being of less specific gravity, floats upon its surface, completely defending it from the oxygen of the blast. Hence we see that the column of the blast-furnace may be divided into three portions; the upper portion, or cementing part; the middle, or melting part; and the chamber, or hearth, where the metal is preserved till it is in sufficient quantity to be run out into pigs. The cementing portion is by far

the most extensive, and will vary in its extent with the strength of the blast.

Since the combustion must be in proportion to the quantity of oxygen consumed in a given time, the heat of the furnace will depend upon the quantity and velocity of the air blown into it to a certain extent. If the blast should have too great a velocity, the oxygen would pass through a greater space in the furnace than is desirable before it was disposed of, and the cementing portion would be lessened in consequence. On the contrary, if the velocity were too little, the heat would be confined to the vicinity of the tuyere, and the cementing, as well as the melting processes, would be retarded for want of heat.

When the blast is sufficient to generate the necessary heat for melting the cinder and the metal perfectly, the extent of the cementing portion will depend upon the height of the furnace. This gives us one very satisfactory reason, why a furnace is required to be higher for the use of coke, than when it is heated with charcoal; since the carbon of the latter enters into the composition of the iron with much more facility than that of the former.

According to experiment, it appears that the facility with which carbon enters into combination with iron, in a close vessel, is inversely as its aggregation or cohesion. Hence it is found, that the carbon obtained from animal substances, which is soft and porous, is best calculated to convert iron into a carburet.

It will appear from the last observation, and from what has been said on the nature of coke, that the carbon employed for cementation should be mechanically different from that required to generate the great and permanent heat necessary to the fusion of the materials. The one in the cementing portion should, therefore, if it were practicable, be surrounded with coke of the softest kind, while the materials within the influence of the blast, and occupying the melting portion, should be supplied with such as is harder.

In making the most highly carbonized iron, or what is called N^o 1, it sometimes happens that a portion of the iron unites with a great excess of carbon, forming a substance, which, when cold, appears in bright shining scales. It is found to possess most of the properties of plumbago, differing from that substance only in containing less carbon. This carburet is no doubt in the liquid form in the furnace, and, being of much less specific gravity than the iron, floats upon its surface. It is so much more infusible than the metal, that before the iron enters the moulds of the pig-bed it is seen swimming at the top in the scaly form before mentioned.

This substance is called by the workmen *kj/b*; and whenever it appears, is a certain sign that the furnace is working on the best sort of iron. So surely, indeed, is it the case, that N^o 1, or the most highly carburetted metal, has received the epithet of *kj/by*, because *kj/b* is the common attendant on its production.

The most remarkable and anomalous circumstance presented in the smelting of iron, is the difference in quantity and quality of the iron made in winter and in summer, when all other things are equal. It is a fact well ascertained, that in order to make the same quantity and quality of iron in summer as in winter, the furnace will not carry so great a burthen, and, at the same time, the means of generating heat requires to be increased.

Various opinions have been given to explain this curious fact. Some have supposed that the proportion of the oxygen was less in the atmosphere in summer than in winter. Others,

that the excess of moisture contained in the air in summer above that in the winter, might explain the phenomenon. Whatever may be the cause of this difference in the blast-furnace, the same may equally be referred to common fires, which, it is well known to every one, are much hotter in winter than in summer. If the Lavoisierian doctrine of combustion were true, we should not expect that the power of air to generate heat would vary with the temperature, since the same caloric which had contributed to dilate the oxygen in summer, would be given up when the oxygen combined with the carbon. Unfortunately for that doctrine, however, we find that the quantity of heat generated during the combination of oxygen, is directly as the quantity of oxygen, whatever may be its state, whether solid, liquid, or aeriform.

It appears from general observation, that the difference in the quantity and quality of the iron made in winter and summer may be, in a great measure, referred to changes arising from variation of temperature. The average result of this atmospheric influence is different with different blast-furnaces, and, indeed, with the materials employed; but in general the quantity varies in winter and summer from $\frac{1}{4}$ th to $\frac{3}{4}$ th, besides the alteration of quality, which in some furnaces cannot be prevented by any change in the burthen.

If the whole of this difference depend upon the temperature of the blast sent into the furnace, we must expect to find it either in the increased rarity of the air, or in the presence of moisture, which exists more abundantly in the atmosphere in summer than in winter; or, perhaps, it may be attributable to both these circumstances.

Soon after the constituent parts of water were discovered, some iron-masters attempted to produce combustion by blowing steam into the furnace. But, notwithstanding the great proportion of oxygen existing in aqueous vapour, their expectations were far from being realized, and the scheme was given up by them under a firm conviction that it never could succeed.

This experiment, however, served to shew that no more mischief might be expected from the vapour of water in the atmosphere, than its merely excluding a portion of oxygen. Conceiving it, therefore, to have no other influence in the furnace, we will submit some calculations to the reader, in order to shew the absolute difference in the quantity of oxygen sent into the furnace in winter and in summer, and to ascertain what share of the defect may be attributed to this circumstance, or whether the whole may not safely be referred to it.

We have much to regret that we are not in possession of more experiments as to the temperature of the air sent into the furnace at different times of the year. The mere temperature of the atmosphere is not sufficient for this purpose, since the air gives out much heat by compression in the blowing cylinder. In a former part of this work (see *BLAST-FURNACE*), a table of some observations was given, on which, as far as they go, reliance may confidently be placed. In this table the temperature of the air was stated when it entered the blowing cylinder, and after it had been compressed into a vault, from which it passed into the furnace. If we take the temperature on its entrance into the furnace in winter at 50° , and in summer at 100° , the difference will be 50° , and the variation in the quantity of oxygen will be inversely as the increased volume of the air. It is found that elastic fluids are augmented in bulk by one degree of Fahrenheit $.00208$ of the whole. Therefore, the quantity of oxygen at 50° will be to that at 100° as $1 + (100 -$

$50) \times .00208 : 1$; and the oxygen, consequently, in summer will be $.104$, or little more than $\frac{1}{10}$ th less than in winter.

The defect arising from the relative quantities of moisture contained in the air in winter and summer will be very trifling, except where the water-regulator is employed instead of the air vault or common regulator. (See *BLAST-FURNACE*.) When the air does not come in contact with any thing moist after entering the blowing cylinder, in order to learn the quantity of water present, we have only to ascertain the relative proportions of vapour existing at the respective temperatures of the atmosphere in winter and summer. It appears from a theorem, which we have founded upon Mr. Dalton's ingenious experiments upon evaporation and the force of vapours, that the quantity of water in air at 32° , at which temperature we suppose it to enter the furnace in winter, is equal to 2.04 grains in each cubic foot. This, in weight, is $\frac{2.04}{561}$; and in bulk, vapour being

to air at 32° as 274 to 561 , equal to $\frac{2.04}{274}$ of the whole, or $.0075$. The summer air, which we take at 55° , contains 5.32 grains in a cubic foot; a quantity amounting in weight to $\frac{5.32}{524}$, and in bulk to $\frac{5.32}{274}$, or $.019$ of the whole. The difference $.0115$ is the deficiency of common air in summer, arising from the presence of aqueous vapour; and makes the total variation in the quantity of oxygen between summer and winter equal to $.1155 = \frac{23}{200}$, or $\frac{1}{9}$ th nearly.

We here consider water as producing injury merely by displacing a certain proportion of oxygen, and not being prejudicial in itself, as is supposed by the generality of iron-masters. The reason given for its bad effects does not appear intitled to much weight. The opinion commonly entertained is, that the carburetted hydrogen set at liberty, carries off a greater quantity of heat than the nitrogen of atmospheric air. An effect which, if even true, is inadequate to explain the appearances. When the air is received into a water-regulator, as is the case in many blast-furnace works, a much larger quantity of moisture may be expected to enter the furnace, than with the ordinary apparatus. In the above calculation, if the air had been received over water, we should find that its temperature in the receiving vessel in winter and summer would be 50° and 100° . The vapour in the former amounts to 4.67 grains in a cubic foot: in the latter, to 18.95 grains in the same quantity.

Hence, air at 100° will contain less oxygen than that at 50° , by $.055$ of the whole; which is a little more than $\frac{1}{18}$ th. This added to the loss by increased temperature alone, will be $.159$, or nearly $\frac{1}{6}$ th.

We may from this conclude, that the extra-quantity of moisture admitted by using the water-regulator, will at any rate increase the difference in the amount of oxygen from $\frac{1}{9}$ th to $\frac{1}{6}$ th, or thereabouts; which, in all probability, will more than counter-balance the good effects arising from its uniform pressure. There does not appear to be, in the present state of our knowledge, any means of effectually remedying this evil. Some good might accrue from admitting the exterior air as cold as possible, and not allowing it to come in contact with water after entering the blowing-cylinder. This may be done to a certain degree, by causing

the air to ascend from a deep pit, by a pipe communicating with the blowing cylinder. This contrivance, however, should be laid aside whenever the air of the atmosphere becomes colder than the average temperature of the earth.

With regard to the defect arising from increase of volume of the air in the summer months, the heat caused by the friction of the blowing piston will be found to contribute much to the evil. The air by this means gets an additional elasticity, and if the same quantity of air be thrown into the furnace it must be effected by decreasing the pressure of the blast, or by increasing the aperture of the *nose-pipe*. If the compression of the air could be effected by any means which would avoid the friction of machinery, it would no doubt be a desideratum in the process of blowing. It will appear from these facts, that in summer, when the quantity of air is deficient from increase of volume, and from the presence of water, that a larger quantity of air should be made to enter the furnace, partly by increasing the velocity, and partly by using a *nose-pipe* of greater diameter. If the deficiency were made up by the increase of pressure only, the velocity would be too great for producing a maximum of combustion, where it is immediately wanted, independent of the mechanical evil it would be liable to produce. If, on the other hand, the aperture of the *nose-pipe* were increased in summer, to make the quantity equal to that of winter, the air would enter in a state of greater rarity, and the combustion would, from this cause, be of less intensity. This circumstance alone, perhaps, is sufficient to prevent a complete remedy of the evil, and will go far to explain the difference between the fractions resulting from calculation and experiment.

We shall conclude our account of this department of iron-manufacture with some general observations upon the nature and properties of pig-iron, as it is applied to different purposes.

When the iron has combined with its full dose of carbon, constituting what is called in the trade, grey, or smooth-faced iron, and also N° 1, it is admirably fitted for making the lighter and finer sort of castings, such as grates and other ornamental work. It is from iron of this quality that the cast-iron cutlery is manufactured, since no other would run sufficiently fluid for articles so small as the prongs of forks, and the bows or rings of scissors. This iron, however, is not the best for larger castings where strength and hardness are desirable; as in large wheels, for example, beams, pillars, railways, &c. The metal employed for these purposes contains a lesser proportion of carbon than the former, and is generally called melting-iron, or N° 2.

That species of pig-iron, however, which is combined with the smallest dose of any, is almost exclusively employed for making malleable iron, and is called, for that reason, *forge-pig*. We have given, in the next section, an account of the proportion of carbon present in the different varieties; and it will appear from thence, that of all the combinations of iron and carbon, steel contains the least, and grey, or N° 1, pig-iron, the most of any of the compounds we are yet acquainted with.

As a proof that pig-iron only requires to lose its carbon to become malleable, we have at present in this country manufactures upon a large scale, for converting cast metal goods, such as nails, cutlery, &c. into iron perfectly malleable, without even changing the figure given to them by casting. Nails produced in this way are so malleable, even when cold, as to bear the hammer, and are capable of being bent to a right angle in a *vice*.

But a still stronger proof that this metal assumed the form of iron is from the great heat it will bear. The

prongs of a common fork made by this process can be welded together with the greatest facility. Pig-iron, until lately, has been considered a much more complex body than experience has warranted. We have heard of its being supposed to contain silicx, or, according to Mr. Davy, silicium, to which it owes some of its crude qualities. But the process just mentioned is sufficient to refute the assertion. Iron masters, even at this day, however, will talk about oxygenated pig-iron, meaning that which is least carbonated; but it must be clear to every one acquainted with the chemical qualities of those bodies, that the presence of carbon and oxygen in a liquid mass is perfectly impossible, as they are incapable of existing together uncombined at any such elevated temperature. Hence we must regard pig-metal as a compound of iron and carbon only. Manganese may perhaps sometimes be present in it, when particular ores are employed for smelting, but its union must be considered as accidental.

To make pure iron, therefore, we have, from these conclusions, only to extricate the carbon. This may be done, in small masses, by stratifying the articles in a close vessel with some substance containing oxygen. The poorer iron ores, which are free from sulphur, are used in powder for this purpose; and after the materials have been exposed to a heat just short of the fusion of the metal, the air being completely excluded, the carbon will become dissipated, and the iron left in a state of purity. See CASTING and FOUNDRY.

§ 4. Conversion of Pig-iron into malleable Iron, and Steel.

1. *Bar, or wrought Iron*.—Iron, as obtained by the reduction of its ores in the blast-furnace, contains, as we have before stated, a certain proportion of carbon, which renders the metal unfit for the various purposes of forging, but constitutes its principal value as applicable to the use of the founder. To deprive it of this ingredient certain processes are gone through, the object of which is, by the concurrent action of heat and air, to dissipate the carbon under the form of an elastic compound. The kind of iron chosen for the conversion is that denominated by manufacturers *forge-pig*. It is the lowest quality made for the purposes of art; and, in consequence of its being combined with a smaller dose of carbon than any other, which thus causes it to bear a less price in the market, is doubly preferable for the end required.

The price of *pig-iron* is almost exclusively determined by the quantity of carbon which is in combination with it. The varieties usually distinguished are N° 1, otherwise called *grey, smooth-faced, or kishy*, metal; N° 2 and 3, and *forge-pig*. The proportion of carbonaceous matter present in these varieties is differently stated by different experimentalists. Clouet makes the highest proportion to amount to $\frac{1}{4}$ th; but from the results obtained by Mr. Mushet in combining iron *directly* with the doses of charcoal requisite to produce its various sub-carburets, $\frac{1}{15}$ th appeared to be the *maximum*. Of this, the following table, published by him in the 13th vol. of the Philosophical Magazine, will afford the necessary proof.

Soft cast-steel	-	-	-	-	-	$\frac{1}{15}$
Common ditto	-	-	-	-	-	$\frac{1}{10}$
Same, but harder	-	-	-	-	-	$\frac{1}{8}$
Ditto, too hard for drawing	-	-	-	-	-	$\frac{1}{6}$
White cast-iron (same as before called <i>forge pig</i>)	-	-	-	-	-	$\frac{1}{5}$
Mottled cast-iron (N° 2.)	-	-	-	-	-	$\frac{1}{4}$
Black cast-iron (N° 1.)	-	-	-	-	-	$\frac{1}{3}$

The first step in the process of decarbonization, according to the more common mode of operating, is to expose the iron in a

furnace, called by some a *refinery*, but by others, to distinguish it from one hereafter to be described, a *run-out furnace*. It consists of a vessel open at the top, imbedded in stone or brick work, about two feet three inches long, two feet wide, and ten inches deep. This is generally, in part, constructed of cast iron; and, when so made, has an outer case about two or three inches distant from the inner one, which is constantly supplied with a stream of cold water to prevent the apparatus from melting. The iron to be decarbonized is placed in this receptacle, and kept in a continual state of fusion for three or four hours by the aid of a coke fire, which is heaped to a considerable height above the level of the vessel, and extended proportionally on the hearth that surrounds it. The size of the hearth is mostly about three yards in length, and from two to three wide, and is completely covered by the funnel of the overhanging chimney. Bellows of considerable size are employed to carry on the process; and the current of air which issues from them is directed immediately on the surface of the iron by one or more *tuyeres*. These *tuyeres* are double, like the case, and continually cooled by the application of the same means. When the decarbonization is completed, the metal is let out at an opening in the side, which has been kept close during the operation by a *stopping* of sand. It flows into a groove about 18 inches wide, and six or seven feet long, constructed of stone in the floor that surrounds the furnace. The bottom of the vessel is so placed as to be nearly on a level with the floor; the only elevation given to it being what is merely sufficient to let the iron run out with facility. A considerable quantity of vitreous oxyd is formed during the process; and the loss in the weight of metal, which is stated to amount to from $\frac{1}{10}$ th to $\frac{1}{7}$ th, is principally referable to this circumstance. The total quantity of carbon which the iron contains originally is not estimated at more than $\frac{1}{3}$ th; and yet the approach of it to the pure state, or, in technical language, to the state of *bar* or *wrought-iron*, after this operation, is very inconsiderable.

The cake of metal procured by these means is broken into lumps of a convenient size, and subjected, in a furnace of another description, to a process known in the art by the name of *puddling*. The furnace, which is also distinguished by the same term, is a variety of the reverberatory; and at the immediate point where the flame strikes upon the hearth, a shallow concavity is worked out, in which the melted iron is exposed. Opposite to it is a door, and through this the metal is kept in continual agitation, by means of a sort of rake, for the purpose of exhibiting fresh surfaces perpetually to the influence of the air. Water is likewise occasionally thrown in, which in some degree contributes to the decarbonization. With the loss of carbon, the iron also loses its fusibility, and about the middle stage of the operation appears in the form of small detached lumps, which scarcely seem to exert any affinity for each other. At length, however, by much stirring, and frequently pressing them together, they cohere into a pulpy mass; and being gathered into pieces of a convenient size, are carried under rollers, where, after passing through four pairs, in succession, of a gradually diminishing gauge, they are produced into plates seven or eight inches wide, and three feet or more in length. Considerable quantities of matter are squeezed out in the rolling, which principally consist of a vitreous kind of oxyd. This is, for the most part, to be referred to the action carried on in the furnace; but some portion of it is, in all probability, created by the combustion of small pieces of fluid metal, which, engaged amongst the particles of the *puddled* mass, are hurled through the air in a state

of vivid inflammation, by the compressive violence of the rollers. The total loss thus sustained is estimated at from $\frac{1}{10}$ th to $\frac{1}{7}$ th. The plates obtained by this treatment have a very incompact appearance; and if attempted to be worked in the state they are then presented under, would crumble almost wholly into small granulated lumps. To impart to them the necessary closeness and solidity, they are again heated in another kind of furnace, and beaten forcibly with a heavy hammer, which is raised by machinery.

Previously to being thus treated, they are broken up into cakes of small size, and placed upon circular slabs of stone from 8 to 12 inches in diameter. The size of the cakes is in a great measure determined by a particular effect of the last pair of rollers that they are passed through: ribs, of a diamond shape, girding either one or both of them, on the whole extent of their surface, which leave a deep indentation on the plates, so as to render them easily frangible in that direction. The height to which these cakes are piled on the circular slab just spoken of, is generally about 12 inches; and when so prepared, they are placed on the hearth of a reverberatory furnace, which differs but little in form from that employed for *puddling*, except in being flat at the bottom instead of concave. The furnace is denominated a *balling furnace*; and the piles of metal, *pies* or *balls*. They are continued in this situation until they have arrived at a welding heat, and are then removed by large tongs under the stroke of the hammer. Near to the place a smith's forge is kept in blast, where long bars of iron are also urged to the welding point; and, after the first stroke or two of the hammer, united to the *ballled* masses, to afford greater convenience in turning them. The masses are beaten out into ingots of about three feet in length; and the bar last mentioned being separated, they are divided deeply by an instrument termed a *set*, to facilitate their being afterwards broken; and the process is then completed. They are in this state called *blooms*, and have yet to undergo another operation, for the purpose of being made into bars or plates. Much loss is sustained by the last treatment, and principally from the same formation of oxyd as was noticed in the preceding case. The quantity thus lost, added to the waste occasioned in the *bloomery*, which comes next to be described, is usually considered as equal to $\frac{1}{4}$ th of the metal obtained by *puddling*; which will make the total deficiency, by all the operations, as nearly equivalent to $\frac{1}{3}$ th. The ingots or *blooms*, which are received from the hammer, after being broken, over a small wedge-shaped block of iron called a *tup*, are placed in a species of reverberatory, very similar to the *balling furnace*, and denominated a *bloomery furnace*, or *bloomery*. They are here heated to welding, and then submitted to the requisite pressure under rollers, which are either plain or grooved, according as the iron is wished to be obtained in plates or in bars. This completes the whole of the processes necessary for making the best malleable iron; and it results from the observations which have been premised, that, in order to procure one ton of it, five-and-thirty hundred weight of *forge-pig* is previously required.

Two other modes of operating are at present in use; one of which omits the *puddling*, and the other, that part of the foregoing process that concerns the fabrication of *blooms*. In the former, iron is exposed to the heat of a charcoal fire, in a species of furnace precisely similar to the one before described as a *refinery*, or *run-out furnace*; and is continued in that situation, until the metal is thought to be sufficiently decarbonized. It is very frequently stirred during the operation; and when brought *into nature*, (to use the technical expression,) is collected into masses, and removed by tongs.

tongs under a large hammer, denominated, as applied to this particular use, a *slamping hammer*, where it is beaten into cakes, which are afterwards broken up, and treated in the *balling furnace* as before described. This is the old mode of working, and the iron obtained from it is by many conceived to be of very superior quality. The heat produced is considerably inferior to that afforded by coke in the *run-out furnace*; and the iron is less surrounded by the fuel than in the case just mentioned. The present charcoal fire is properly a *refinery*, and not the one which is used merely as a preliminary to the process of *puddling*. Here, the business of decarbonization is at once completed; and the resulting metal is in the same state of purity as that yielded from the rollers, after it has been *puddled* by the other method. *Balling* and *blooming* follow in regular succession, and plates or bars are produced exactly as before.

According to the second mode of treatment, in which *blooming* is omitted, the masses obtained from the *balling furnace* are reduced under the hammer into the form of solid, cubical blocks; and when their temperature is too much lowered to be capable of any farther working, they are again heated in a fire called a *chafery*, which is urged by a powerful pair of bellows, and scarcely differs from a common smith's forge, except in being larger, and the coals upon it being heaped up to the unusual height of at least two feet. In this situation they are raised to the point of welding, and afterwards hammered out into ingots of a flattened shape. Iron bars are united to them very shortly after they are brought from the *balling furnace*, to afford a greater facility of management, in the same manner as was described in the making of *blooms*; and these, as before, are detached, when the ingot is sufficiently formed. The iron produced in this way is not considered so good as that afforded by either of the other processes, and is employed, for the most part, in the commoner services of art. Repeated rolling, or hammering, is the only means of imparting the fibrous texture so necessary to good bar iron; and as this treatment is less frequent in the present mode of operating, the deficiency of value in the material obtained may very probably be referable almost exclusively to this circumstance.

The above include the whole of the *important* variations that are presented in the manufacture of bar iron. Other shades of disagreement may be traced in different works; but they are of a nature too trifling and unimportant to merit any particular enumeration. The art is still in its infancy; and the light of chemical science, by being brought to a focus here, cannot fail to disclose many improvements in the present modes of procedure, which will greatly abridge the expence now incident to this valuable branch of national industry. That the mere abstraction of about 4 *per cent.* of carbon should require a sacrifice, in effecting it, of above 40 *per cent.* of iron, appears monstrous beyond example: and as those who are connected with the art become more scientific in their views, we shall unquestionably find that it will be much more economically accomplished.

When iron has been completely freed from carbon, and has acquired its highest degree of malleability by repeated hammerings, it is by far the most tenacious of all the metals, and is capable of being drawn into the finest wire.

The tenacity of iron, as well as of all the rest of the malleable metals, varies considerably according to its softness. After iron has been kept in a red heat for some time, and suffered gradually to cool, it becomes remarkably changed in point of softness. By being hammered, drawn into wire, or rolled, it increases in hardness to a certain extent; but, at the same time, partly loses its malleability.

By this mechanical treatment, when cold, its strength or tenacity increases; and it may be taken at one point, when it will require a far greater weight to break it, than if it were hammered either more or less.

All the experiments yet published relative to the tenacity of iron, and the other metals, are on this account very defective. The writer of this article has seen an iron wire, when newly annealed, break with a weight of 50 pounds; but, after being drawn through two holes of a wire plate, bear above twice that weight, without sustaining injury. Iron, when properly annealed, will bear more bending backwards and forwards before it breaks, than in any other state: but the strength, or that power which resists a weight, exerted longitudinally to break it, is jointly as the last property and its hardness. Hence the reason why its strength is increased with a certain degree of hammering. The specific gravity of malleable iron, according to Brissot, is 7.788; that of pig iron being 7.207. Iron, in a state of purity, requires so great a heat for its fusion, that the best crucibles are nearly ready to melt with it. It has, however, been fused, and cast into an ingot. It is said to liquify at 158° of Wedgewood. Its malleability is greatly increased by heat; and by raising it to a very high temperature, it becomes exceedingly soft, and may be brought so near to absolute contact with another piece similarly heated, that they unite firmly together. This process is called *welding*. Its great affinity for oxygen, when heated to a welding point, would very soon reduce it to an oxyd, if it were not for the vitreous matter fusing upon its surface; and it may be still more completely defended, by dipping it in powdered glass or sand. See *Description of Plates* at the end of the article.

2. *Steel*.—This substance, which is a compound of iron and carbon, but in less proportion than that of pig iron, is of such distinguished importance in most of the arts, that no other substance could be substituted, capable of supplying its united properties of hardness, tenacity, and elasticity. After the pig iron is totally deprived of carbon, and becomes malleable, the metal can be re-impregnated with that substance to a certain extent, without losing much of its malleable property.

It is curious to remark, that although we have made iron of excellent quality in this country, for all the nice purposes to which it is capable of being applied, yet, in attempting to convert it into steel, we have always failed; the steel being red-short, and otherwise bad. It, of late, however, has been so great a desideratum to obtain steel from British ore, in consequence of our want of communication with Sweden and Russia, that several efforts have been lately made to bring about this desirable object, and not altogether without success. We may yet entertain a hope, therefore, that the time *will* arrive, when we shall not be dependent on other countries for this useful commodity.

The only steel at present, on which perfect reliance can be placed, is made from some of the best marks of Swedish iron. The bars are stamped with certain letters or characters, well known to the steel-makers; and some of them have preserved their character for making good steel during a long series of years.

The size of the bars varies from 3 inches broad and $\frac{1}{2}$ inch thick, to about 2 broad by $\frac{7}{8}$ thick.

Nothing more is necessary to impregnate the bars of iron with carbon, by which they become steel, than to stratify them with powdered charcoal in a close vessel, called a cementing pot; exposing the same to a degree of heat as little short of what would fuse the steel as possible.

The

The furnace in which the process of cementing bar iron is performed is called a converting furnace.

The pots are made of a peculiar stone called fire-stone, from its joint property of not being liable to crack by the heat, and its little disposition to enter into fusion. It is a fine grit, and occurs abundantly in the neighbourhood of Sheffield. The interior of these pots is in dimensions from 12 to 15 feet long, and from 2 feet to 30 inches square. Every furnace contains two of them; and they generally hold about 5 tons of iron each. The metal is stratified with the charcoal dust, in such a way that each bar may be completely covered; and the last stratum, which should be thicker than the rest, is kept close with a mixture of clay and sand, so as to prevent the charcoal beneath it from entering into combustion with the outer air.

The fire is then gradually applied, and the exterior surface of the pots constantly enveloped with flame, till the whole mass has become of the heat required. This heat is kept up for a considerable time, so that from the commencement of firing to the maximum is about seven days. The same space is afterwards required to allow the mass to cool. This rule, however, is not sufficient to tell when the cementation is perfect. A hole is generally left in the front of the furnace, passing through the wall to the interior of the pot. One or two bars are laid with their ends projecting into the opening, which is loosely filled with powdered charcoal. When the process is supposed to have gone on long enough, one of these bars is drawn out and examined.

All bar iron must, owing to the manner in which it is made from the pig, contain a small portion of oxyd of iron, as well as some remains of iron not completely deprived of its carbon. The long continued heat which this process requires, cannot fail to cause an union between the oxygen and carbon, accidentally existing in the bars; and we may expect, in consequence, that an elastic fluid will be formed, which must be either carbonic acid or the carbonic oxyd; but since the oxyd is in the state of finery cinder, we should rather conceive it to be the latter; and we believe experience warrants the conclusion.

This elastic fluid, when the metal is so near the fusing point, causes the surface of the bars to be covered with blisters, which are a sure sign that the cementation is complete: and it is from the number and size of these blisters, that the workmen know when to cease adding fuel to the furnace.

Steel is made of different degrees of hardness, by giving it more or less carbon; and this is effected by keeping up the heat a longer time, still having regard to the quantity and size of the blisters.

The steel used for coach-springs contains the smallest quantity of carbon; a somewhat greater proportion is required for table knives, forks, carpenters' tools, and agricultural implements; and the largest dose of all is wanted for files, which can scarcely be too hard, if the steel be sufficiently malleable to work.

Steel, in the state it comes from the cementing furnace, is called *blistered steel*, from the appearance we have just described. It is not used but for common purposes, although formerly we had no other kind. The bars of iron being formed under the forge hammer, and produced in a country not remarkable for the excellence of its machinery, the metal is found to abound with numerous seams and shells, which good workmanship might in a great measure avoid.

This evil is, however, very happily remedied, by making

the blistered-steel into what is called *shear-steel*, and *cast-steel*.

Shear-steel has derived its name from the advantage with which it has been applied in the manufacture of sheep-shears. Its admirable property of welding to iron, without the other qualities it possesses being injured, renders it of great importance in all cases where the body of the edge-tool is constructed of iron, and the edge merely steel.

From having been first made at Newcastle-upon-Tyne, it has also been called *Newcastle steel*. The apparatus used for its manufacture consists of a pair of bellows, or other blowing machine, and a fire place similar to that of a smith's hearth, but upon a larger scale. The hammer for drawing the bars is larger than a tilting hammer, but smaller than the one employed at an iron forge.

In order to make shear-steel, a number of bars of the best blistered-steel are laid together, and temporally fastened. In this state they are introduced into the fire, and heated to a welding temperature; after which they are firmly united by means of the hammer, and drawn. At a second heat these masses are beaten down into bars about $1\frac{1}{2}$ inch broad and $\frac{1}{8}$ th of an inch thick. By this process the loose parts and seams of the bars are closed together, and the steel is rendered susceptible of a polish, of which before it was not capable. But these are not the only advantages. The additional hammering so far improves its malleability, that the tenacity it enjoys is much greater, while its hardness is very little less.

This steel is particularly adapted for springs of every description, and for all edge-tools requiring great tenacity rather than hardness.

Cast-steel is entirely free from the mechanical defects which belong to blistered-steel, and even, in some degree, to shear-steel; since it consists of the latter variety completely fused, and cast into ingots.

The furnaces employed for this purpose should possess all the advantages which can be given to air-furnaces, on account of the great heat requisite for the process. (See FURNACE.) The crucibles, in which the steel is melted, are made of Stourbridge clay, mixed with a small quantity of powdered coke, which makes them less liable to crack in the heating or cooling; and, at the same time, gives to them a considerable degree of stiffness in the fire, when raised to the very great heat required. These crucibles are furnished with covers, which are of rather more fusible clay than the body of the vessel, and, on that account, are soon partially vitrified; by which means they become closely luted at the time the steel is at a temperature sufficiently high to be destroyed by the oxygen of the atmosphere.

The fuel employed for melting steel, consists of the hardest cokes, and in all cases where long continued and high temperatures are necessary, cokes of this description should always be employed. Two advantages attend the use of them; for although the soft cokes produce a very great heat during a short space, yet the length of time required for melting steel would oblige the workman to charge the furnace too often; so that he would ultimately get a greater heat by the permanence of the hard coke; and the specific gravity of the latter is so much greater than the soft, that the fuel is more condensed, and hence, allowing for the difference of cohesion, will give more concentrated heat, if the supply of air be sufficient.

The crucibles are of a size sufficient to hold about 30lbs. of steel; and, in general, each will bear charging three times, or even four: some would remain sound still longer than that, if the fires were continued; but they are seldom kept

kept in more than twelve hours in the day, and this will not allow of more than three heats. For the best possible cast-steel, the bars of the best blistered-steel are broken into small pieces, it being, on coming from the cementing furnace, sufficiently brittle for this purpose. An inferior kind of cast-steel is made from the scraps, which consist of the waste of the manufactories. The heat required to melt steel is very great; and inversely as the quantity of carbon combined with it. Before cast-steel making was brought to great perfection, the quantity of carbon given to it was greater, in order to effect its more easy fusion. The crucibles and furnaces, however, are now so much improved, that the steel can be melted with much less carbon, and it is, in consequence, so *kind*, to use a technical phrase, as to weld with iron, and even to be capable of uniting two pieces of it together.

After the steel has become sufficiently fluid, it is poured into cast-iron moulds, which form it into ingots of an octagonal shape; and are about 30 inches long, each weighing about 30lbs. Formerly, the great secret of making cast-steel was said to consist in using some peculiar flux. No substance, however, from what has been observed, can increase the fusibility of the steel, but an additional dose of carbon, which is improper after a certain quantity has been united with it. The only substance, therefore, which can be employed to any advantage, must be some fusible vitreous matter, capable of floating upon the surface of the metal, and defending it from the contact of air.

The flux at present used, and the most proper for this purpose, is the blast-furnace cinder. But pounded glass, or any vitreous substance which fuses a little before the metal melts, will answer equally well.

The ingots of cast-steel, as well as the bars of blistered-steel, and shear-steel, are drawn into rods ready for forging into various articles, by a piece of machinery called a *tilt*, or *tilting-mill*. (See *TILTING-MILL*.) By this hammer, the cast-steel can be drawn down to the size of $\frac{1}{2}$ inch square. But in reducing smaller than that, it would be liable to be injured in its fabric. It is drawn into rods of smaller size by hand, for the purpose of making gravers, and watch-makers' tools: and for still more delicate articles, it is manufactured into wire. The blistered-steel will not bear drawing to a small size, on account of the looseness of its texture.

Steel is of a mean specific gravity between wrought and pig-iron; and, like the former, it increases its property in this respect by hammering. Like iron, too, it becomes softer on being annealed, but never becomes so soft as that metal. When of good quality, and at a certain degree of hardness, it is stronger than iron; that is, when stretched longitudinally by a weight; but, by sudden bending or twisting, it is more liable to break short. In working it with the hammer, it will not bear so great a heat as iron; since the temperature iron and its combinations sustain without melting, is inversely as their dose of carbon.

This property of bearing heat, is, however, in a still less ratio in cast-steel. This is owing to its having entirely lost its fibrous form in the melting. Hence there is less danger in heating it after it has been hammered.

In welding steel to iron, or steel to steel, the fire ought to be very free from sulphur, or other extraneous matter; and the heated parts of the rods should be frequently supplied with either sand, or sand mixed with the scales which come from the hammered iron. This fuses upon the surface and keeps off the air. See *FORGE*.

The most singular property which belongs to steel, is that of its hardening by being heated red-hot, and cooling rapidly. This change is greater the hotter the steel, and the

colder the fluid into which it is plunged. (See *CUTLERY*.) Water, in general, is employed for this purpose; and spring-water is better than any other. If the water abound with animal or vegetable matter, the hot steel cools more slowly. This is occasioned by a film of the matter in solution forming and remaining upon the surface, and, being a bad conductor of heat, prevents the steel from cooling. File-makers say, that the salt which is inevitable in their hardening water, makes the steel harder, and they sometimes put sulphuric acid into it for the same purpose.

In hardening steel in thin plates, such as saws, particularly when of cast-steel, quenching in water would cause them to crack, and make them so hard as not to be useful. They have, in consequence, recourse to some substance which is not so good a conductor of heat. Oil, with tallow, bees' wax, and resin dissolved in it, is generally employed for these articles. (See the article *SAW*.) If the steel be heated red-hot, it mostly returns to its original state. This, however, is sometimes not the case with thin plates of cast-steel. In giving various degrees of heat from the hard state, it becomes more soft and less elastic. See *CUTLERY*.

This curious and valuable property which it possesses might, at first view, appear to be caused by an increase of density; but the specific gravity of hardened steel is less than before it is hardened. It has been said to depend upon a certain crystalline arrangement of its particles; but this is a mere apology for ignorance. The most plausible theory we have heard of is mentioned in one of Dr. Darwin's notes to his "*Botanic Garden*," and was the idea of a very ingenious friend of that celebrated author. This theory was equally applied to the singular property possessed by the glass toys known by the name of *Prince Rupert's Drops*. It is as follows. When the heated steel or glass is plunged into water, the exterior stratum becomes so hard and solid, as not to be capable of shrinking; and every succeeding layer is to a certain degree placed in the same situation. When caloric leaves a body slowly, it contracts in its dimensions, until it assumes something near its original volume. But if any force prevent the parts from approximating, the molecules will attract each other with a power equal to the repellent energy of the caloric that caused the expansion. So soon, however, as the outer stratum is broken, the whole of the others are destroyed in succession. This is most glaringly the case with the glass drops before spoken of, and, to a certain extent, with unannealed glass, and hardened steel.

With respect to the latter, however, it is confined to large masses, and particularly of cast-steel. The rollers employed by jewellers and others are of cast-steel, and are very liable to break in the hardening, although about half the mass in the middle is pure iron. They do not always crack at the time, but at different periods afterwards, and frequently, when no violence is applied to them, some have been known to fly six months after being finished. Sometimes they break with great report, and what strengthens the above opinion as to the cause is, that the figure of the roller is frequently changed from a round to an elliptical shape. For farther particulars, see *STEEL*.

§ 5. Chemical Properties.

When a piece of polished iron is exposed to the air, it soon loses its lustre; and if the atmosphere be humid, it becomes covered with red spots called *rust*. When it is exposed at 400 degrees of Fahrenheit, it changes to a yellow colour. The temperature being increased, the colour gradually turns to a brown, and at the heat of about 600° it becomes of a beautiful blue tint. This change of colour arises from the combination of oxygen; the

the quantity increasing with the temperature. If the surface be defended by a coating of chalk and a solution of glue, no change of colour takes place when the heat is applied. In the art of blueing steel, advantage is taken of this method to make the blue ornamental.

In a higher temperature the surface becomes covered with a scaly crust, which is composed of oxygen and iron; and in the heat of a smith's forge, it combines with oxygen so rapidly as to burn, throwing off sparks in bright corruscations. If small iron wire be exposed in pure oxygen gas, the end being ignited with a bit of greased cotton, the metal enters into brilliant combustion, and a globule of melted matter is formed at the end of it. The iron so burnt loses all its metallic properties, by combining with the oxygen; and during this change the phenomena of burning take place. The globule is so brittle as to be capable of being reduced to powder, and is called the black or vitreous oxyd of iron.

Iron has so great an attraction for oxygen, that it decomposes water even in the cold. When filings of that metal are mixed with water in a vessel connected with a pneumatic apparatus, an elastic fluid is evolved, which is found to be hydrogen. The iron loses its metallic lustre, and ultimately is converted into the black oxyd before spoken of.

If this mixture be in a retort, and the boiling heat applied, the iron combines with the oxygen of the water with much greater rapidity; and, of course, a much greater quantity of hydrogen is eliminated. This method has been employed to obtain the black oxyd of iron, which was formerly called *Martial Ethiops*. Iron decomposes water with very great rapidity, when the sulphuric or muriatic acid is present. The acid takes up the oxyd as it is formed by the agency of the water, and a new surface is constantly presented. A large quantity of hydrogen is in this process disengaged, and it is by the present method that this gas is procured for filling ærostatic machines, and for other purposes. If the oxyd which is taken up by the acid be precipitated by an alkali, and dried instantly, it will exhibit a similar appearance to that obtained by the action of water alone. When first separated it has a green appearance, which it owes to the presence of water; and this being dissipated by heat, it is left of a dark-grey colour. This oxyd, formed by either of the above processes, is called the prot-oxyd of iron, because it is combined with the *first* or smallest dose of oxygen. According to Proust and Lavoisier, it consists of 73 of iron, and 27 of oxygen.

If the prot-oxyd of iron be exposed to the air in a red heat for a length of time, it assumes a red colour, and constitutes the substance known in the arts by the names *crocus* and *colcothar*. This change of colour is found to have been caused by its combining with an additional dose of oxygen, and the product is denominated the peroxyd, consisting, according to Proust, of 52 iron, and 48 oxygen. From the best chemical authorities, it appears that iron unites with oxygen only in two fixed proportions, constituting the prot-oxyd and the peroxyd; although it has been held by some that there are more varieties.

If a bar of iron be heated red-hot, and a stick of sulphur applied to it, a fluid substance will drop from its end, which is found to be compounded of sulphur and iron, and in chemistry is called sulphuret of iron. The fusion of sulphur and iron-filings, in a crucible, gives a similar product. The attraction between these substances is so great, that their union in nature is very common.

Iron-filings, mixed with sulphur, and made into a paste with water, in a certain time become very hot and even produce flame. The mixture is sometimes buried under ground to produce an artificial volcano. This phenomenon, how-

ever, does not depend upon the immediate combination of the sulphur with the iron. The water, which is a considerable agent, is decomposed; the oxygen uniting with the iron to form an oxyd of iron, and with the sulphur to form the sulphuric acid, while the hydrogen combines with another portion of the sulphur producing sulphuretted hydrogen, which occasions the flame in the experiment.

When iron-filings are heated with sulphur, even where oxygen is not present, at a little short of the temperature of redness, they combine and produce flame. We are indebted to the associated Dutch chemists for this fact, as well as a similar experiment with sulphur and copper.

The artificial compound of sulphur and iron, from the experiments of Proust, is composed of

62.5 sulphur

37.5 iron

100

The native sulphuret is found to contain a greater proportion of sulphur. When heated in a close vessel, some of the sulphur sublimes, and may be collected in a proper apparatus. By this treatment, it is reduced to the state of common sulphuret, and loses 20 *per cent.* of its weight. It is hence composed of

50.6 sulphur

49.4 iron

100

According to some experiments made by Mr. Hatchett, however, these proportions are not regular in specimens where the crystalline form varies. This ingenious chemist has found a native species agreeing in the proportion of its constituents with the artificial sulphuret. It is what has been called magnetic pyrites; and is by this test of the magnet distinguished from the common pyrites, which does not possess that property. It has also another peculiar character. If dilute sulphuric or muriatic acid be poured upon it, a rapid action takes place, and sulphuretted hydrogen is evolved. This is not the case with the super-sulphuret till it has been exposed to heat, when it loses its excess of sulphur. The common sulphuret of iron has been employed to make artificial magnets. Mr. Hatchett found that not only the sulphurets, phosphurets, and carburets, were separately magnetic; but suspects that certain proportions of all these may constitute a *maximum* of magnetic virtue.

It is highly probable, that the iron is the only substance possessing magnetism; and that the facility with which these compound substances become magnetic, may arise from the greater ease with which the particles of iron assume the peculiar arrangement on which this curious property depends. That some arrangement, though perhaps equally mysterious with crystallization, may be the cause of magnetism, there is much reason to believe. By mixing iron-filings with melted resin, and inclosing them in a brass tube, if a magnet be brought near to the tube, while the mass is still liquid, the whole, when cold, will become a magnet. During the touching of a piece of steel to make it magnetic, there is little doubt but that a new and peculiar disposition takes place amongst the particles, notwithstanding the solid state of the metal. The particles of bodies appear to be free to motion in the solid form. We find that iron combines with carbon, while both bodies are in that state; and what is still more curious, the compound assumes a different crystalline structure, according to the proportions of the two bodies. Oxygen appears, in some instances, to alter the internal arrangement of solid bodies. If brass, for example, were to be kept in a damp room, but more particularly where the fumes of

of acids are present, the metal, although previously very tenacious and ductile, becomes so brittle, as not to bear bending to a right angle; at the same time that the broken surfaces exhibit a crystalline fracture. That species of form, therefore, under which magnetism exists, may be brought about by various means. All iron instruments, kept in one position for a length of time, become magnetic; especially if that position coincide with the magnetic meridian. We regret that so little is known on this interesting subject; and for farther particulars refer to the article MAGNETISM.

Iron combines with several of the metals forming alloys, none of which have very striking or useful properties. The alloy of iron and gold has been examined by Mr. Hatchett, who found that 11 parts of gold to 1 of iron formed a malleable alloy, remarkably ductile, so as to roll into plates, and be capable of being stamped into coin. The colour was of a pale yellowish-grey, and it was of the specific gravity of 16.885. The most singular property of this alloy is its increase of volume by combination. Before the union, the bulk was 2799; and afterwards, 2843. The very contrary is the case with most of the other alloys of metals, and agreeably to Berthollet's doctrine of affinity, we find that the mean specific gravity of bodies by experiment, is greater than the arithmetical mean, directly as the affinity of the bodies. We should, therefore, in this instance conclude, that either the affinity of the metals is trifling, or that the above law is not general.

The alloy of pure iron with platina has not been effected from the great infusibility of the two metals. Dr. Lewis alloyed cast iron with platina, as well as steel. The specific gravity of this alloy, contrary to the last, was greater than the arithmetical mean. It was very hard and tenacious, possessing some degree of ductility.

After being kept ten years, it was little tarnished. Iron is easily alloyed with silver. In equal parts they form a compound of considerable ductility, of the colour of the latter metal, but much harder; and is attracted by the magnet. The metals separate, in some degree, when kept in fusion; but, according to the experiments of Morveau, not completely; the silver retaining some of the iron, and the iron some of the silver, by which its quality, as a metal, is much improved. Iron is not easily combined with copper in large quantity. We find, however, that these metals are capable of uniting, and the alloy is, in some degree, magnetic. Indeed, in forming certain instruments of brass, where the magnetic needle is employed, they are frequently defective from this circumstance. To free copper entirely from iron, it should be redissolved in an acid. The oxyd, after precipitation, should be dissolved in aqua ammonia, and the alkali then distilled from it. This being afterwards treated in a close vessel with some inflammable matter, the metal will be obtained pure. The alloys of tin and iron, and that of iron with zinc, may be formed by mixing clean iron-filings, or turnings, with those metals while in a state of fusion. These compounds are not of any use. Iron may be soldered with several of the metals. Copper, gold, and silver, unite to it with great facility; but require the presence of borax to keep off the air.

The most permanent solder for iron is the carburet of the same metal, called N^o 1, pig-iron. The pig-iron loses some of its brittleness, and the malleable metal becomes much harder. It does not appear improbable that steel might be formed by uniting these two substances together in certain proportions.

We have next to treat of the salts of iron, or its combinations with acids.

Sulphat of Iron.—Sulphuric acid does not combine with iron in its metallic form; in conformity with the general law that no acid unites with a metal till the latter is previously oxydated. Iron is but slightly acted upon by this acid in the cold; but with a degree of heat far short of boiling, the iron takes from it a portion of oxygen, converting it into the sulphurous acid, which escapes in the form of gas. The iron, thus oxydized, combines with another portion, and forms the sulphat of iron.

When water is added to the iron and the acid, a much more rapid action takes place. The metal seizes the oxygen of the water; hydrogen is evolved; and the acid unites with the oxyd forming the salt in question. When the product obtained by this means is more than the water can dissolve, it assumes the form of green crystals, which, when separated, are the same with those known in commerce and the arts by the names of *green vitriol* and *copperas*.

In the action of iron upon the concentrated sulphuric acid, it appears anomalous, that the metal should not be oxydized with more facility by this acid, when water is so rapidly decomposed, the elements of which have so strong an attraction for each other. It may appear equally strange that the water is not decomposed when the acid is not present. When it is recollected, however, that the oxyd of iron is not soluble in water, nor sulphat of iron in the acid, it will appear very clear that the two substances are both essential to the effect; the acid promoting the decomposition of the water by taking away the oxyd, and the water taking up the salt, which would be equally obstructive to the process.

This salt is not commonly obtained by the above process. The sulphuret of iron, above described, already consists of two of its elements, namely, sulphur and iron; the oxygen and water of crystallization being alone wanting to complete the salt under inquiry. For this purpose, the natural combination of it, or pyrites, is first roasted, and then exposed in large heaps under sheds. These heaps are frequently moistened with water, by which, together with the presence of the air, the iron and the sulphur become oxygenated, and crystals of the sulphat begin to form. The water, which is thrown on from time to time, dissolves the salt, and runs into large reservoirs, which are also under sheds, to prevent the rain falling into them. This solution, however, does not contain the salt in a fit state for crystallization, being too highly charged with oxygen. The liquor is transferred into large boilers, and pieces of old iron put into it, which, by taking up the excess of oxygen, change the solution from a red to a green colour. When the evaporation has gone on to a certain point, the salt crystallizes, and the green crystals being separated, are fit for sale.

When the crystals are obtained from a clear solution, and are well defined, exhibiting transparent rhomboidal prisms, the specific gravity of which is 1.8, the salt may be deemed in a state of purity. It dissolves in $\frac{3}{4}$ ths its weight of boiling water, and twice its weight of water at 60°. When kept dry, it is not liable to change in the air; but if moistened it becomes covered with red spots by the absorption of oxygen, and if it be dissolved in water, it returns to the state in which it existed before boiling with the metallic iron. When the crystals are heated, the salt at first fuses, then assumes the form of white powder, by losing its water of crystallization. At a red heat the acid begins to fly off; and ultimately a fine red oxyd is left behind. It is in this way the *crocus* of commerce is prepared.

According to the analysis of Bergmann, this salt is composed of

I R O N.

Acid	-	-	39
Protoxyd of iron	-	-	23
Water	-	-	38

100

According to Kirwan :

Acid	-	-	26
Oxyd	-	-	28
Water	-	-	46

100

It is decomposed by the alkalies and alkaline earths ; and by all the salts forming insoluble compounds with sulphuric acid.

Oxy-sulphat of Iron.—This salt consists of the sulphuric acid united to the peroxyd of iron. Its solution in water is of a deep reddish-brown colour. It is insusceptible of crystallization. Hence, the green crystals separated in making copperas are perfectly distinct in their nature from the salt which is left in the remaining liquid. When the sulphat is exposed in a state of solution for a length of time, it assumes a red colour, and is converted into this salt ; so that we never find the common sulphat in mineral waters, but the oxy-sulphat. This change may be more speedily brought about by heating it with nitric acid. A quantity of nitrous gas is evolved, and, according to Mr. Davy, ammonia also ; the former from the decomposition of the acid, the latter from the decomposition of both the acid and the water. The fluid gradually assumes a deep brown colour. It has a strong astringent taste, much resembling the juice of sloes. When this salt is formed without the addition of water, it is exceedingly heavy, and concentrated, and of a deep brown tint, approaching to blackness. If concentrated sulphuric acid be poured into it suddenly, it loses its brown colour, and becomes of a clear white, having the consistence of thick cream. It is so soluble in water, that when evaporated slowly, instead of crystallizing, it assumes the form of syrup. If too much heat be applied, however, the oxyd either precipitates, or it assumes the form of a sub-salt, and becomes insoluble.

Since the oxy-sulphat differs from the sulphat in the proportion of oxygen only, several substances reconvert it into that salt, by abstracting the excess of oxygen. If it be kept, for instance, for some time in a close-topped bottle with iron-silings, the metal becomes oxydized, and the whole is changed to the simple sulphat.

Gay-Lussac has lately shewn that the quantity of acid in any metallic salt is in proportion to the quantity of oxygen in the metal. (*Memoires d'Arcueil*, t. ii. p. 159.) Hence no additional acid is required in converting this salt into the sulphat.

Tin, and several other metals, produce the same effect. The excess of oxygen may instantly be taken away by passing sulphuretted hydrogen gas through the oxy-sulphat. This gas reduces the oxyd exactly to a *minimum* of oxydation, to the state of protoxyd ; and hence the reason why this gas does not precipitate iron from its solutions.

The oxy-sulphat may be easily separated from the sulphat ; the former being soluble in alcohol, which the latter is not.

From the method required to form this oxy-salt, it will appear that there are several substances which may be employed to give their oxygen to the sulphat of iron. Of these are the nitric and oxy-muriatic acids. And by pouring a

solution of gold into a solution of this sulphat, the oxy-sulphat is produced, and the gold becomes metallic.

Dr Thomson enumerates several *triple* salts, formed by the sulphuric acid with iron and other metals.

1. Sulphat of iron and copper.
2. Sulphat of iron and zinc.
3. Sulphat of iron and nickel.

The former of these sometimes exists in the blue vitriol of commerce, which is a very great evil to colour-makers. The iron precipitates with the copper, and destroys the beauty of the latter. In order to ascertain whether iron be present in blue vitriol, dissolve a small quantity in a wine-glass, and add aqua ammonia till it smells strong of the latter. The oxyd of copper will be dissolved, and the oxyd of iron left at the bottom. By standing for some time, the precipitate becomes yellow and very conspicuous. It is even said that some of these salts have triple bases. The two hitherto observed are as follows :

1. Sulphat of iron, zinc, and nickel.
2. Sulphat of iron, copper, and nickel.

Sulphite of Iron.—Berthollet has given us an account of a compound of iron with the sulphurous acid. When iron is exposed to the action of this acid, it becomes speedily oxydized ; but what is singular, not at the expense of the water, as is the case with the sulphuric acid ; but it appears that the acid is decomposed, the oxygen uniting with the iron, while the sulphur combines with the salt. Hence this sulphat of iron is always contaminated with sulphur. The sulphurous acid has a less affinity for iron than the sulphuric ; and if the latter be added to the sulphat, its acid is disengaged in the form of gas.

Nitrat of Iron.—The nitric acid has very violent action upon iron, and an abundance of the red fumes of nitric oxyd are disengaged. The same thing in some measure takes place with this acid, as has been remarked with regard to the sulphuric. If it be more than a certain strength the action is feeble, until a certain portion of water is added. The same explanation will answer in both instances. The nitric acid does not dissolve the nitrat at first formed, the presence of which interrupts the future progress of the operation. When the solution is made with much water the iron is oxydized to a *minimum*, and the salt formed is the proper nitrat. It is of a pale green colour. The vessel in which this solution is made should be kept in water as cold as possible, else it will absorb too much oxygen, and pass to the oxy-nitrat.

Oxy-nitrat of Iron.—When iron is acted upon by the less diluted acid, and with heat, the salt formed is the oxy-nitrat. The solution is of a deep brown, resembling the oxy-sulphat. It has a strong astringent taste, and turns vegetable blues red. When the solution is boiled the oxyd is partially precipitated ; nor will it afterwards dissolve in the nitric acid. This has furnished one means of separating iron from other substances in the analysis of minerals.

We are indebted to Vauquelin for a method of obtaining this salt in a crystallized state. The method he recommends, is to keep the black oxyd of iron and strong nitric acid together for a length of time, till the crystals appear. They have an acid taste, and are deliquescent. The form of them is that of a four-sided prism.

The alkalis precipitate the oxyd of iron from this salt of a fine yellow colour, and yield a product which is valuable to painters.

Muriat of Iron.—The muriatic acid, like the sulphuric and nitric, acts feebly upon iron, except it be diluted to a certain extent with water. It differs from the latter, and

agrees

agrees with the former, in not being decomposed; but merely takes up the oxyd formed by the oxygen of the water, the hydrogen being given out in the state of gas. The solution is of a green colour; and, on evaporation, it affords crystals presenting the same appearance. Mr. Davy has given us several useful facts relative to this salt. It was employed by him to great advantage in making some endometrical experiments. He found that a solution of it absorbs a large quantity of the nitric oxyd gas, which, in this situation, is better fitted for absorbing oxygen than by mixing the two gases together. By absorbing this gas it assumes a brown colour, and acquires an astringent taste. When the compound is heated, it appears that the gas is decomposed as well as a portion of water; since the iron becomes more highly oxydized, and ammonia is formed. Mr. Davy recommends an infallible method of forming this salt, by adding muriatic acid to sulphuret of iron. The sulphuretted hydrogen prevents the muriat from becoming oxy-muriat, which has not the property of absorbing the nitric oxyd. Muriat of iron is very soluble in water and in alcohol. It is decomposed by the alkalis and alkaline earths, and all salts, the bases of which form insoluble compounds with muriatic acid; such as silver and mercury.

Oxy-muriat of Iron.—The muriat of iron, like the sulphat and nitrat, is converted into the oxy-muriat by the oxyd of iron passing from the state of prot-oxyd to that of per-oxyd. It slowly undergoes this change by exposure to the air; and rapidly, by the agency of those bodies which afford oxygen with greater facility, as the nitric and oxy-muriatic acids. The solution is of a deep brown, but does not afford crystals by evaporation. It has a powerful, astringent taste, and a peculiar odour. When this salt is distilled it affords oxy-muriatic acid, leaving in the retort the prot-oxyd of iron.

If the heat be applied rapidly, the salt sublimes; not in the state of oxy-muriat, but of muriat of iron.

There is also a triple salt formed by the muriatic acid with iron and ammonia. This may be prepared by adding iron-filings to muriat of ammonia. It may either be obtained in crystals by evaporation, or it may be sublimed. In the latter state it is known in medicine by the name of *Flores Martis*.

Phosphat of Iron.—The phosphoric acid has little action upon iron; but the acid unites with the prot-oxyd, and forms this compound.

It is prepared by adding a solution of sulphat of iron to a fluid mixture of phosphat of potash. The salt precipitates in the form of a blue powder, which is insoluble in water, and does not lose its colour by exposure to the air.

The substance known by the name of native Prussian blue, is a phosphat of iron; but, what is remarkable, it has little colour when dug out of the earth, becoming deeper on exposure to the atmosphere. A crystallized specimen, lately brought from Brazil, has been analysed by Vauquelin, and is composed of

Acid	21
Protoxyd	45
Water	34
	<hr/>
	100

Oxy-phosphat of Iron.—This salt is formed by taking advantage of some oxy-salt of iron and phosphat that is soluble; as, for instance, by adding together the oxy-sulphat, or oxy-muriat of iron, and the phosphat of soda or of potash, a white powder will be precipitated, which is the oxy-phosphat of iron.

This salt is insoluble in water, but dissolves in the muriatic or fulphuric acids; from which it may be precipitated, unchanged, by pure ammonia.

Sub-oxy-phosphat of Iron.—The salt above described is not decomposed by the alkalis like the metallic salts in general. The alkali combines with a portion of the acid only, leaving the salt with an excess of base, which is the sub-oxy-phosphat of iron. This sub-oxy-phosphat does not dissolve in water, or scarcely in acid: but it has the singular property of dissolving in albumen, or the white of eggs: and if an alkali be present, which is the case with the albumen in the serum of blood, it assumes a reddish-brown colour, and is supposed, therefore, to be the principal colouring matter of the red blood of animals.

Fluat of Iron.—The liquid fluoric acid attacks iron, or rather takes its oxyd, which is formed by the oxygen of the water, while hydrogen gas is evolved. It has no striking properties, or any which it may be important to describe.

Borat of Iron.—This salt, being insoluble in water, is obtained by mixing solutions of borat of soda and sulphat of iron together. It appears in the form of a yellowish powder, and melts into glass before the blow-pipe.

If the oxy-sulphat of iron be employed, an oxy-borat will be obtained.

Carbonat of Iron.—When iron-filings are mixed with the liquid carbonic acid, and suffered to remain for some time, the water will acquire a perceptible taste of iron. If it be exposed to the air, a precipitation takes place, either from the gas flying off, or from the salt assuming the state of sub-carbonat. The precipitate is of a yellow colour. This salt is frequently found in mineral waters, to which it gives a peculiar odour. The water, by standing a little while, is not sensible to any of the tests of iron; but a yellow precipitate is found at the bottom of the vessel.

When a solution of neutral carbonat of potash is added to a solution of sulphat of iron, a large quantity of iron is dissolved by the carbonic acid, giving to the fluid a strong inky taste.

This salt is also found native in the solid form, of which we have already spoken in the mineralogical part of this article.

The common rust of iron, formed by exposing iron to the air, may be proved to be a carbonat of this metal by its effervescence with acids. It is, no doubt, from the solubility of this salt, that iron becomes so perishable by exposure to the weather.

The sub-carbonat of this species, according to Bergmann, is composed of

24 acid
76 oxyd
<hr/>
100

It appears from some experiments of Bucholz, that the native carbonat, by heating red-hot, becomes magnetic.

Acetat of Iron.—The acetic acid, when of moderate strength, added to iron-filings, causes the iron to be oxydated by the decomposition of the water, while the hydrogen is set at liberty. The solution has a sweetish, though inky taste, and emits the odour of vinegar. The best way of forming this salt is by mixing acetat of lead and sulphat of iron together. The sulphat of lead becomes insoluble, and the acetat of iron remains in the liquid. Mr. Davy obtained this salt by digesting the sulphuret of iron with acetic acid. It afforded to him crystals in small prisms.

Oxy-acetat of Iron.—If the oxy-sulphat of iron be used instead of the sulphat with the acetat of lead, the sulphat

of lead is precipitated, and an oxy-acetat is held in solution of a beautiful reddish-brown colour. This salt does not afford crystals. It has the smell of vinegar; and, when in solution, affords an excellent test for arsenic. The arsenic forms an insoluble compound with the iron, of a brilliant orange tint. The pyrolignic acid, which is an impure acetic acid, unites with iron, and yields a very cheap acetat of iron, which is used by dyers and calico printers as a mordant.

Succinat of Iron.—When the solutions of succinat of potash or soda, and sulphat of iron are mixed together, a brownish-red insoluble precipitate is formed, which is the succinat of iron. The soluble succinat may hence be employed to separate iron from other substances.

It is composed of

Acid and water	61.5
Oxyd - - -	38.5
	<hr/>
	100
	<hr/>

The *oxalat*, *tartarat*, *citrat*, *malat*, *benzoat*, and *suberat* of iron, are but little known. They are all, however, soluble in water.

Gallat of Iron.—When the gallic acid is added to any solution of iron, the oxyd being at a *minimum* of oxydation, a fine purple precipitate will be produced. If the acid be entirely freed from tan, the purple colour is much more conspicuous. The pure gallic acid, therefore, is much better as a test for iron, than the mere infusion of galls.

The tan may be separated from this acid by means of gelatine, which does not precipitate the gallic acid. By this treatment a solution may be obtained colourless and limpid.

If the gallic acid be added to a salt of iron, in which the oxygen is at a *maximum*, the precipitate is a very complete black; but the oxyd soon separates, and falls to the bottom in the form of a red powder. This property renders these salts of iron unfit for making writing ink. When the oxyd is in the state of prot oxyd, the combination is permanent; and although it is not so black when first used, it soon becomes dark by exposure to the air. We may hence learn, that while ink is in use, it should not be kept exposed to air; since it passes to the state of oxy-gallat, and the oxyd will fall down.

Prussiat of Iron.—When the triple prussiat of potash and iron is poured into a solution of the latter substance, the oxyd being at a *minimum* of oxydation, a white powder is precipitated, which is the prussiat of iron. If this powder be exposed to the air, it changes to a blue; and in this state is called the oxy-prussiat of iron.

Oxy-prussiat of Iron.—This salt is formed by the same soluble prussiat being added to the oxy-sulphat of iron, and constitutes the beautiful blue pigment, known by the name of *Prussian blue*. It is generally, however, adulterated with alumine. See *PRUSSIAN BLUE* and *PRUSSIC ACID*.

Arseniat of Iron.—The native arseniat has been already described in the mineralogical part of this article. Arseniat of potash, or ammonia, being added to the sulphat of iron, an insoluble powder precipitates, which is the artificial arseniat of iron.

Oxy-arseniat of Iron.—The arseniat of iron, in common with all the other salts of this metal, combines with an extra dose of oxygen, constituting the oxy-arseniat. The precipitate formed by the arsenic acid and the oxy-acetat of iron is of a blueish-white colour.

The oxy-arseniat of iron, from the analysis of Chenevix, is composed of

Acid	42.4
Oxyd	37.2
Water	20.4
	<hr/>
	100
	<hr/>

Arsenite of Iron.—The arsenious acid, or the common white arsenic of commerce, forms with iron peculiar compounds, which have been but little examined. It does not take the oxyd of iron from the sulphat, but decomposes the acetat, forming with the protoxyd a substance of a greenish-yellow colour; the precipitate from the oxy-acetat being of a bright orange. If either of the acetats contain the least portion of the sulphat of iron, it prevents the precipitation of the arsenite.

Chromat of Iron.—See *CHROME*.

Most of the other acids combine with iron; but they form compounds which are but little known. Certain alkaline salts act upon iron, and produce triple compounds, which have not received a particular examination. When the nitrat of potash is fused in contact with that metal, the acid is decomposed, and the iron oxydized to a *maximum*. This melted mass, after the acid is completely dissipated, is of a red colour. If, before it becomes deliquescent, which takes place from the presence of the alkali, it be thrown into water, the alkali dissolves a quantity of iron, forming a solution of a deep splendid purple tint. The colour remains permanent for some time, if the air be excluded; but, if exposed in an open vessel, it changes quickly to a green, and the oxyd ultimately precipitates, leaving the liquid clear and colourless. The precipitated oxyd is of a deep red colour.

Description of Plates.

Plate I. fig. 1, a plan of an iron forge; *fig. 2*, an elevation of the same. In *fig. 1*. A is a water-wheel, which gives motion to the stamping hammer E; G, the mill-dam; H, the tail water course; I is a small water-wheel, to give motion to the blowing machinery; L, *fig. 1*, is another water-wheel, which works the hammer o, for drawing the balls, &c. into bars; K is the mill-dam for supplying all the wheels.

Q, in *fig. 1*, is a refinery, technically called a *finery*; in *fig. 2* is the elevation. It is blown by the double blowing cylinders, e, e. R, the *chafery* for heating the masses of iron a second time after hammering; S, S, plans of balling furnaces, and similar to the puddling furnace.

Plate II. fig. 1 is a front view of the finery, as seen *fig. 2. Plate I.*; *fig. 2* being a side view. K, the hearth on which the pig-iron and charcoal is placed; G H, the chimney; f, the air-pipe; g, a cock to regulate the blast; b, a leathern pipe connecting the main-pipe with the nose-pipe; i, *fig. 3*, an enlarged view of the tuyere-iron, into which the nose-pipe i is inserted, and which enters the hearth at a, *fig. 1*; m and n are two iron pipes, terminating in, and forming a part of the tuyere-iron. The pipe m communicates with a cistern of water, which conveys a stream of cold water, for the purpose of keeping the tuyere-iron cool, and which is discharged at n, into the cistern o, *fig. 4*, where the whole of this apparatus is seen. The furnace called the *run-out furnace* is very similar to the finery. The hearth of the finery is surrounded with cast-metal plates, having a cavity under the bottom plate, to throw water from time to time to keep the bottom plate cool. The *run-out furnace* differs from this, in being surrounded on three sides with water. This furnace, and its use, has already been described. The *chafery* is also similar to the finery,

finery, except in the hearth being more like the smith's forge.

Fig. 5. exhibits tongs for taking the balls from the furnace to the hammer; and fig. 7. an iron ladle, employed to throw water into the puddling furnace, to oxydate the iron.

Fig. 8. the face of the stamping hammer, which is made to be taken out occasionally.

Fig. 9. the face of the hammer employed for drawing out the bars: *b* is the part used to extend the bars in length with more expedition; the part *a* being employed for smoothening or finishing the bar.

Figs. 10. and 11. are different views of the balling furnace: *a* is the fire-grate; *b*, the hole where the fuel is admitted; *d d*, the roof made of fire-brick; *e*, the door through which the balls are admitted; and *b b*, the hearth on which the balls are laid to be heated, by the flame which is carried by the draught of the chimney *G*. This furnace is bound on all sides by bars of iron, secured by bolts.

The puddling furnace is so nearly similar to this, as not to require a separate drawing. The hearth is more concave opposite the door, for the purpose of containing the metal which is liquid, previous to its assuming its malleable state. The door of this furnace, for heating the balls, consists of a frame of wrought iron, containing fire-bricks, to prevent the escape of heat. It shuts and opens upon the hole, by being attached to the end of a lever; its weight being counterpoised at the other end. See fig. 1. Plate IV. where *R* is the lever; *b*, the door; and *f*, the part by which it is raised.

The door of the puddling furnace consists of a solid piece of cast-iron, about 3 inches thick, having a small hole through it, for the purpose of inspecting the process, and introducing the puddling instruments.

Plate III. figs. 1. and 7. are views of the reverberatory furnace, used by the cast-iron founders, for melting large quantities of metal at once. This furnace, like the last, is heated with flame from its fire place *a*, the fuel being introduced at *B*; *c d* is a sloping hearth, on which the pigs or other pieces of metal are laid; *b*, the door where it is introduced; and *g*, the chimney. The melted metal runs down to the part *e*, where it is accumulated, and is let out at *f*; or a door may be opened at *e* above, and the melted metal carried out in ladles, to be poured into the moulds.

Fig. 2. is a section of a cupola, in which *a* is the interior of the furnace containing the metal and coals; *e*, the tap hole; *b*, the nose-pipe; *d*, a leathern pipe connecting the air-pipe, which comes from the blowing cylinder, with the same; *c*, a stop-cock to regulate or turn off the blast.

It generally consists of four plates of cast-iron, firmly bolted together; the interior being lined with fire-brick. This furnace is generally employed for the best kind of work, and will melt many charges in a day, according to the nature of the metal exposed in it.

Plate IV. figs. 1. and 2. are two views of forge-hammer machinery, erected by the celebrated Smeaton. *A* is the water-wheel; *H*, a fly-wheel; *D*, wheel-work to open the shuttle by a little at once, for the purpose of adjusting the quantity of water; *F*, a cog-wheel to give motion to the wheel *G*; at the other end, *I*, are a number of cogs, which lift the hammer *K*, fig. 2, by passing under its shaft, or helve, as it is sometimes termed; *L*, a large beam of wood inserted into the post *M*, and passing horizontally over the hammer. Into the posts, *M* and *N*, is inserted a piece of ash-timber *o*, against which the hammer *K* strikes in its ascent, and by its elasticity re-acts upon the hammer, and

gives it a greater descending velocity than would be produced by gravity alone. *Q* is a number of heavy pieces of metal laid upon the beam *L*, to increase its *vis inertia*, and will, in consequence, receive less motion from the hammer. (See MILL-WORK and WATER-WHEEL.) The hammer here described has been much improved, so far as regards the spring at *o*.

That already mentioned in the plate is much preferred. The whole of it is made of cast-iron, and its weight is about 35 *cwt*. It acts simply by its gravity; its extra force, therefore, over the common one, consists in its greater quantity of matter. It is made exceedingly massive near the centre of motion, by which means its centre of oscillation is thrown nearer to that point, and it consequently descends with greater velocity. Although this is an advantage with respect to the number of strokes in a given time, it is a disadvantage in another way; since the centre of oscillation is also the centre of percussion, or the point where the greatest stroke is made. Could the velocity be obtained without this evil, the advantage would be material. See TILTING-MILL.

IRON, in the *Materia Medica*, is said to have greater virtues than any of the other metals, which is not to be wondered at, as being the only one that is in a manner soluble in the human body. All the other metals, whether hard or soft, poisonous or salutary, may even fluid mercury itself, swallowed in their crude state, pass out of the body again unaltered; but this is not the case with iron, its crude filings are often taken as a medicine, and are always so much acted upon by their juices, as to produce considerable effects. It is so easily wrought upon out of the body also by fire, and by different menstrua, that it becomes an aperient or astringent, as it is differently treated; and is, under proper management, greatly superior to all other medicines in chronic cases.

Iron or steel, that is, the *ferrum* or *chalybs*, may be employed indifferently, as Cullen suggests, in the preparation of the rubigo; but he thinks that, upon the whole, the preference is due to the iron in its soft malleable state, or in that which is called "forged iron." As iron, says this medical writer, like all other metals, in its solid and entire state, is not active with regard to our bodies, without being corroded or dissolved by saline matters, he is of opinion, that it is rendered active only by being combined with acids. It has indeed been common to give the entire metal, brought by filing into a fine powder, and with very good effects, as a medicine. But this he does not consider as an exception to his general rule; because he is persuaded that there is constantly present in the human stomach a quantity of acid capable of dissolving iron; and as a proof of it he alleges that he never knew iron given in its metallic or slightly corroded state, without producing a blackness in the stools, which affords a presumption of a previous solution of the iron in acids. As this combination with acids is necessary, physicians and chemists have diversified this combination in a variety of ways; Dr. Cullen observes, that he has not known a preparation of iron for the purpose of medicine, that has not been prepared by a combination with acids, or by bringing the iron into a state that rendered it readily soluble by the acid of the stomach, and Dr. Lewis very properly remarks, that Prussian blue, though truly containing a quantity of iron, as it is not soluble in any acid, is the least promising of all the medicinal preparations.

Its virtues internally were not unknown to the ancients; Dioseorides attributes both an astringency and aperientcy to it, and prescribes it in hæmorrhages. He also recommends its rust, or *crocus martis*, in suppressions of the menses; though

though he, on the other hand, prescribes wine or water, in which red-hot iron has been quenched, as an astringent in dysenteries, diarrhoeas, and weaknesses of the stomach.

Iron combined with acids becomes an astringent substance; and hence its great medicinal virtue is caused by its tonic and strengthening qualities; for by increasing the tone of the vessels, it increases their vigour and activity. It produces a slight and gentle irritation of the fibres, the effect of which is to constrict the sensible organic parts upon which it acts, and to increase their force and elasticity. Iron particularly acts upon the fibres, and the vessels of the stomach and intestines; hence it produces excellent effects in all diseases which proceed from laxity and inactivity of the digestive organs. Such are crudities, bad digestion, accompanied with diarrhoea, flatulencies, flatulent colics, &c. &c. in diseases which proceed from the former, as many hysterical, hypochondriacal, melancholic affections, intermittent fevers, tertians and quartans, &c. In those cases iron quickens the circulation and raises the pulse; renders the blood more florid, and as it were expands and rarefies the juices, promoting, when they are deficient, and restraining, when immoderate, the secretions that are made from the blood, as perspiration, urine, and the uterine purgations. By the same corroborating power, which renders it serviceable in promoting deficient, and restraining redundant discharges, where the suppression or flux arises from debility and relaxation, it increases, on the contrary, fluxes, and confirms obstructions, when they proceed from tension, rigidity, or spasmodic strictures of the vessels. Where either the circulation is quick, or the habit plethoric, by increasing the velocity of the blood, and the plethoric symptoms, it produces heaviness, dulness, vague heats and flushings, or kindles more dangerous fevers or inflammations, or bursts some of the over-distended small vessels. In some constitutions, where iron is proper and salutary, particularly in hysterical and hypochondriacal cases, and where the stomach is very weak, it is apt at first to occasion great sickness and perturbation: to remedy these inconveniences, Sydenham advises, to begin with very small doses, and to administer it for a while at bed-time, in conjunction with a slight opiate. In other circumstances, it is commonly taken in the morning and afternoon, and moderate exercise used to promote its action. In all cases the dose should be small and repeated; a grain, or half a grain of the metal dissolved, or in a soluble state, is generally a sufficient dose. Its effects are known by nidorous eructations, and by the alvine feces being tinged of a black colour.

Stahl, and several other modern chemists and physicians, acknowledge only the tonic and strengthening qualities of iron. The cases in which iron has produced a resolving and aperient effect are those, in which the obstructions, and the defect of secretions and excretions, have proceeded from weakness and relaxation of the fibres and of the vessels, rather than from a crassitude of humours, as in the chlorosis, in some kinds of jaundice, and other diseases of the same sort.

The same preparation, as Dr. Lewis has judiciously observed, may sometimes exert an aperient, and sometimes an astringent, power, according to the state of the body to which they are applied. *E.g.* If a retention of menses depends upon a weakness in the vessels of the uterus, chalybeate medicines, by invigorating the force of the vessels, may cure the disease, and may thereby appear to be aperient; and, on the contrary, in a menorrhagia, when the disease depends upon a laxity of the extreme vessels of the uterus, iron exhibited, by restoring the tone of these vessels, may

shew an astringent operation. However, it is probable, that in the cases of suppression depending upon a constriction of the extremities of the vessels of the uterus, the same tonic powers may not be so properly employed. By considerations of this kind, the inutility or propriety of the medicinal preparations of iron may be determined. In all cases of active hemorrhagy they must be hurtful; and in cases of hemorrhagy from external violence, Dr. Cullen would judge them to be useless, if not hurtful. In cases of a general flaccidity, as it is frequently marked under the title of "Cachexy," and in all cases of evacuations from laxity, whether sanguine or serous, they are likely to be the most effectual remedies. The good effects of the preparations of iron, as Dr. Cullen apprehends, have been often missed by their being given in too small doses. The saline preparations, in large doses, are ready to irritate the stomach; and for this reason, and some others, it must be always proper to begin with small doses, and to increase them by degrees; but he has often found, that no great benefit is to be obtained but when large quantities, either by the size of the doses, or by the long continuance of them, have been thrown in. He says, that he has found the simple rust as effectual as any other preparation, and the stomach has borne it better than any other. He begins with a dose of five grains, but gradually increases it to what the stomach easily bears. Some are said to have given it to the quantity of six drams in one day; but he has hardly found any stomach that would bear the third part of that quantity without much sickness. He thinks that the stomach bears it better by joining with it some aromatic.

The preparations of iron that have been in more frequent use, and some of which are at present continued under different names, are, 1. The crude filings reduced to an impalpable powder; this is an excellent form for administering iron in female disorders, in which the body is weak, languid, and full of acidities; the dose of the filings is from two or three grains to a scruple or more. 2. "Mars saccharatus," which is the filings candied with sugar, by dissolving two parts of fine sugar in water, and boiling it down to a candy consistence, and adding, by little and little, one part of the cleaned filings in a kettle over a gentle fire; the vessel being continually shaken, that the filings may be crusted over with the sugar. In order to prevent the mixture from running into lumps, a little Marsh is previously mixed with the sugar, in the proportion of a dram to a pound. 3. "Limatura Martis preparata," or "Chalybis rubigo preparata," is formed by moistening the filings with vinegar or water, and exposing them to a moist air, or occasionally moistening them afresh, which soon change in great part into rust; this rust may be separated from the uncorroded part, by grinding and washing over the fine powder with water. This is given in the same dose as the crude filings.

This preparation, which was denominated "chalybis rubigo preparata" in the London Pharmacopeia of 1745, and "ferri rubigo" in that of 1787, is now called "ferri carbonas," or carbonate of iron. It is formed of sulphate of iron, eight ounces; sub-carbonate of soda, ten ounces; and a gallon of boiling water. Dissolve the sulphate of iron and sub-carbonate of soda separately, each in four pints of water; then mix the solutions together, and set by the mixture, that the precipitated powder may subside; having poured off the supernatant liquor, wash the carbonate of iron with hot water, and dry it upon bibulous paper in a gentle heat.

There are two oxyds of iron, both of which are combined with acids, and form different modifications of the same salt, a distinction that ought to be particularly regarded in

in medicine; they have been named, from their colour, black and red oxyds; the former, which is black, or (if formed as in the present instance, by precipitation from water) greenish, consists of iron 73, and oxygen 27, according to Lavoisier. It may be formed in various ways: as by exposure of a paste of iron-filings and water to the air; by heating together one part of red oxyd of iron, and two parts of iron-filings; and by adding a solution of alkali to one of green fulphate of iron, and drying the precipitate quickly without exposure to air; and it is kept as a separate article in the Edinburgh Pharmacopœia, under the name of "*Ferri oxydum nigrum purificatum*." The latter, or red oxyd, consists, according to Proust, of iron 52, oxygen 48, and in its relation to black oxyd is composed of 66.5 of that oxyd, and 33.5 of additional oxygen. Some chemists have supposed the existence of other gradations of combination of iron and oxygen, but the above are all that are generally admitted, or that require particular notice; this latter is also kept in the Edinb. Pharmac. under the name of "*oxydum ferri rubrum*." Salts containing the black oxyd, on exposure to air, pass to the state of red oxyd, by attracting oxygen from it, and in the process of drying, the same change happens here to the oxyd in the sub-carbonate, which, at the time of its first precipitation, is a black oxyd. The same substance, more imperfectly prepared, constituted the rust of iron (*ferri rubigo*) of the former Pharmacopœia, for which, in all the processes into which it entered, this precipitate is now substituted. The red oxyd of the Edinburgh college is the old "*Colcothar vitrioli*," and formed by exposure of common fulphate of iron to a strong heat, sufficient to drive over its sulphuric acid, when the red oxyd remains behind, as in the process which was formerly in use for obtaining that acid. Sub-carbonate of soda is preferred for the precipitation to that of potash, on account of the greater solubility of the fulphate of the former than of the latter alkali, and the consequent facility with which it may be washed away. The salt is a sub-carbonate, but as only one of the compounds is kept, the relation is not expressed. The dose of the "*ferri carbonas*" is from two to ten grains.

4. "*Mars sulphuratus*," prepared by mixing iron-filings with twice their weight of flower of brimstone, and as much water as will make them into a paste, which in a few hours swell up, and is then pulverized, and put into a heated crucible to deflagrate, and kept constantly stirring with an iron spatula, till it falls into a deep black powder: this powder urged longer in the fire, becomes red, and is called, 5. "*Crocus martis aperiens et atringens*." 6. The salt or vitriol of iron, "*ferrum vitriolatum*," called "*Sal martis*." This is now disused. See *Crocus Martis*.

This is the "*ferri fulphas*," fulphate of iron, of the Lond. Pharm. of 1809; and is composed of iron and sulphuric acid, of each by weight eight ounces, and four pints of water. The sulphuric acid and water are mixed together in a glass vessel, and the iron is added: then, after the effervescence has ceased, the solution is filtered through paper, and evaporated, so that crystals may form as it cools. The water is afterwards poured away, and the crystals are dried upon bibulous paper. Upon a large scale this salt is formed from native sulphuret of iron (*pyrites*) by moistening, and exposing it to the open air. The fulphate of iron is afterwards dissolved in water and crystallized by evaporation. Sulphuric acid will unite either with the black or red oxyd: the first of these is the salt here intended for internal use, and upon this point great stress ought to be laid; as the last is the state in which the fulphate of trade is usually found, and which, for medical purposes, is a very distinct and inferior

thing. Its crystals are transparent rhomboidal prisms, of a light green colour; its taste is astringent and strong, and it reddens vegetable blues. One part is soluble in two of cold, and in three-fourths of boiling water. It is insoluble in alcohol, in which menstruum the red fulphate is soluble, and this affords a method of ascertaining the existence of the latter with the former, as also of separating it. On exposure to air it is gradually converted into red fulphate: it consists, according to Kirwan, of acid 26, iron 28, and water 46, parts. Heat drives off the water of crystallization, and the salt remains white: if urged farther, it drives over the acid, and leaves first a red fulphate, and at last a red oxyd of iron. The dose of the "*ferri fulphas*" is from one to five grains. 7. "*Tinctura martis in spiritu falis*," P. L. 1745, "*Tinctura ferri muriate*," P. L. 1787, or "*Tinctura ferri muriati*," tincture of muriate of iron, P. L. 1809. This is formed by pouring the muriatic acid, in the proportion of a pint, upon half a pound of carbonate of iron in a glass vessel, and shaking it occasionally for three days: then setting it by, that the fæces, if there be any, may subside; pouring off the solution, and adding three pints of rectified spirit. This salt appears to be an oxymuriate of iron, the red oxyd of iron employed becoming, on its combination with the acid, black oxyd, and giving over its superabundant oxygen to the muriatic acid. This appears to be its state, because sulphuric acid added to it detaches oxymuriatic acid, and heat drives over oxymuriatic acid; and in the latter instance, although the red oxyd was used for its preparation, the black oxyd remains behind. The salt, evaporated to dryness, yields an orange-coloured mass, which is encrystallizable, deliquesces on exposure to air, and is soluble in alcohol. The tincture has a brownish yellow colour, and very astringent taste. 8. "*Flores martiales*," P. L. 1745, flowers of iron (see *Flores*), "*Ens Veneris*," P. L. 1720, "*ferrum ammoniacale*," P. L. 1787, or "*ferrum ammoniatum*," ammoniated iron, P. L. 1809, is composed by intimately mixing carbonate of iron and muriate of ammonia, of each a pound, and subliming by immediate exposure to a strong fire, and, lastly, reducing the sublimed ammoniacal iron to powder. This substance consists of red muriate of iron, mixed by sublimation with muriate of ammonia. It is orange-coloured, with a smell resembling saffron, is deliquescent, and soluble in alcohol. The residue, which is deliquescent, consists also of red muriate of iron, and was formerly kept under the name of "*lixivium martis*." The dose is from three to fifteen grains. 9. "*Tinctura florum martialium*," P. L. 1745, "*Tinctura martis Mynsichti*," P. L. 1720, "*Tinctura ferri ammoniacalis*," P. L. 1787, or "*Tinctura ferri ammoniati*," tincture of ammoniated iron, P. L. 1809, is formed by digesting four ounces of ammoniated iron in a pint of proof spirit, and then straining. This is an elegant chalybeate, and may be given in doses of a tea-spoonful. 10. "*Ferrum tartarizatum*," or tartarized iron, P. L. 1787 and 1809, called also "*Mars solubilis*," and "*Chalybs tartarizatus*," consists of iron, a pound, supertartrate of potash, powdered, two pounds, and a pint of water. Rub them together, and expose them to the air in a broad glass vessel for eight days, then dry the residue in a sand bath, and reduce it to a very fine powder. Add to this powder a pint more of water, and expose it for eight days longer; then dry it, and reduce it to a very fine powder. This is a triple salt, in which the iron is first oxydized by being moistened and exposed to air, and then combines with the superabundant acid of the supertartrate of potash; and it is therefore a tartrate of potash and iron. It may be dissolved in water and crystallized. This elegant and useful chalybeate may be given either in a solid or liquid form, from five grains

grains to a scruple. It has been usually distinguished in the shops by the name of its inventor, Dr. Willis. 11. "*Liquor ferri alkalini*," or solution of alkaline iron, is composed of $2\frac{1}{2}$ drams of iron, two fluid-ounces of nitric acid, six fluid-ounces of distilled water, and six fluid-ounces of the solution of subcarbonate of potash. Having mixed the acid and water, pour them upon the iron, and when the effervescence has ceased, pour off the clear acid solution; add this gradually, and at intervals, to the solution of subcarbonate of potash, occasionally shaking it, until it has assumed a deep brown red colour, and no farther effervescence takes place. Lastly, set it by for six hours, and pour off the clear solution. This preparation was first described by Stahl, and called "*tinctura martis alkalina*," and it is for the first time introduced into the London Pharmacopoeia of 1809, as affording a combination of iron distinct from any other, and often applicable to practice. It seems to be a triple salt, formed by the union of nitric acid with red oxyd of iron, and with potash. Dr. Lewis has observed, that alkaline solutions of iron are ill adapted for medicinal use; and on that account, he says, they have been wholly neglected in modern practice. 12. "*Vinum ferri*," wine of iron, P. L. 1787 and 1809, "*Vinum chalybeatum*," P. L. 1745, consists of two ounces of iron-filings mixed in two pints of wine. The mixture is set by for a month, occasionally shaking it, and it is then filtered through paper. Lewis Mat. Med. Cullen Mat. Med. London Pharmac. 1809. See *Chemical Properties of Iron, Chalybeates, and Mineral, &c. WATERS.*

IRON, Case-hardening of, a process by which a superficial hardness is given to various articles made of iron. It is found by experience that pure iron is not susceptible of a very fine polish, and that, when it is exposed to the air, it very soon changes. All iron utensils, therefore, such as fire irons, and many other articles, having the appearance of polished steel, are case-hardened, for the purpose of giving them a finer polish, as well as rendering their colour more permanent. The goods to be case-hardened should be finished with the exception of polishing, since, if the process be well managed, the most delicate workmanship will not be injured. A box of wrought iron must be provided, which is perfectly found in every part, having a lid of the same metal, to fit very tight. In this box the articles are to be stratified with powdered carbon, that of animal substances being the best, for reasons given in the article IRON, in the section on *Steel*. The box being perfectly filled with these materials, let the lid be fitted on, and luted all round with a paste made of equal parts of pipe-clay and Calais sand. The whole is now to be surrounded by bricks loosely built up, a little higher than the top of the box, leaving about four inches on each side for fuel. This may be done either upon a smith's hearth or in the open air. The most proper fuel is the refuse-coke from any fires where pit-coal is burnt. The fire being kindled, and the space filled up with this fuel, the heat will be applied gradually, owing to the smothered combustion. As soon as the box appears of a light red heat, let it remain about half an hour, or more time if the box be large, in the same temperature. The lid may now be taken off, and the box inverted and its contents emptied over a cistern of cold water. If the box be suffered to cool without being opened, the goods will be perfectly white and metallic when taken out. If they are now heated red-hot, and quenched in cold water, they acquire the same hardness as if turned out of the box red-hot into the water. If the articles are very delicate, so as to be injured by the air in heating a second time, they may be preserved, by dipping them into a mixture of a saturated solution of salt (muriate of soda) with any vegetable matter to give it a pulpy consistence. During the time of

heating it red-hot, the salt fuses upon the surface of the metal, defending it from the oxygen, so that after it is quenched in the water, and brushed, it will be perfectly clean.

The size of the iron box should not be very large; it is better to do the work at two or three processes. Charcoal is a very bad conductor of heat, and if the mass to be heated were large, those articles near the sides would be over done, by combining with too much carbon, while those in the middle would be too little carbonated.

People in the habit of case-hardening, have generally some secret receipt for the process, on which they set great value. All, however, agree in using carbon, the only thing necessary: some add to this salt-petre; others sal ammoniac, and other articles, to which they very knowingly attribute their relative success. We can, however, assure the most sage of these persons, that if they make their box perfectly air-tight, by the rules above given, stratifying the articles with animal carbon alone, they will, with proper heat and time, produce the greatest possible effect.

Animal carbon may be produced from most animal substances: among these are blood, hoofs, and leather. These substances should be pressed into an iron pot, which can be heated red-hot, covered close, with a small open tube inserted into the cover. The volatile matter that escapes may be set on fire, which will in a great measure destroy the smell; or a receiver may be adapted, and the crude ammonia distilled off. When the volatile substances have come over, the residuum will be fine animal carbon, which requires only to be reduced to powder.

This animal carbon is so fitted for combining with iron, that if it be made into a pulp with a saturated solution of salt, and laid upon the surface of iron; upon being heated red-hot, and quenched in cold water with this coating upon it, the surface will become hard. Any part of an iron article, not wished to be case-hardened, may be prevented from undergoing the change, by covering the part with pipe-clay.

IRON, For the blueing of, see BLUEING.

IRON, For the expansion of, by heat, see HEAT and PYROMETER.

IRON Chambers. See CHAMBERS.

IRON, For the refining of. See REFINING and IRON, § 4. *supra*.

IRON, For the conversion of, into steel. See IRON and STEEL.

IRON Furnace. See BLAST-FURNACE, and IRON, *supra*.

IRON, Harping. See HARPING.

IRON-liquor, in Calico Printing and Dyeing, is a solution of iron in the acetic acid, used as a mordant for certain colours. It is employed as a substitute for the sulphat of iron, and is preferred, in those processes, to the last salt. The oxyd of iron, which is the essential ingredient, is more easily attracted by the stuff from the acetic than the sulphuric acid, and, besides, the texture is not so liable to be injured by the acetat as the sulphat of iron. In order to make this substance cheap, the acid distilled from wood, called pyrolignic acid, and now found to be impure acetic acid, is used as a substitute for vinegar. See PYROLIGNIC ACID, and the last section of the article IRON.

IRON moulds are marks or stains produced on substances, particularly linen and cotton, by the oxyd of iron. The affinity of these vegetable substances for the oxyd of iron is so great, as not only to take it from the surface of iron, but from any acid with which it may be combined. We find, hence, that very few acids are capable of removing iron-moulds. From the well-known fact that the attraction of acids for oxyds of metals is more feeble as the latter contain more

more oxygen, we are enabled to account for iron-moulds being easier to remove, as they are more recent. The stain soon acquires an orange-red colour, by absorbing oxygen, and is with more difficulty extracted. Various means are employed by the laundresses for removing stains of iron, the most general of which is the citric acid, commonly called salt of lemons. The muriatic acid is frequently employed by the bleachers, and it is by far the most rapid and effectual process; but the great caution necessary, in suddenly washing the spot after the stain has disappeared, lessens its utility for domestic use. When the spot is dipped into the clear muriatic acid, the iron almost instantly disappears, and it is at that instant the part should be plunged into a quantity of clean water, and washed as quick as possible; the washing being continued for a considerable time.

In order to render the oxyd of iron more easily soluble by any acid, let the part stained be steeped for some time in a solution of sulphuret of potash, or, what is more easily obtained, sulphuret of lime, rinsing it afterwards in clean water. The oxyd will be deprived of some of its oxygen, and may be removed by almost any acid, when it is so dilute, even, as not to injure the stuff, however long it may remain in it.

It may be proper here to observe, that the tartaric and oxalic acids remove iron-moulds equally well with the citric acid.

When the substance iron-moulded is printed calico, and of a buff colour, or any other colour in which iron is employed as a mordant; it will be found that, in removing the iron-mould, the proper colour will also disappear. In this case there is no effectual remedy.

Most of the iron-moulds are produced in the washing, for want of sufficient caution. In those utensils in which metal is at all necessary, copper or zinc should be employed instead of iron. With care, however, iron vessels may be safely used. When they are not in use, the surface of the iron should, after being made clean and dry, be smeared over with oil or tallow, and rubbed dry at the time they are used.

IRON-moulds, yellow lumps of earth or stone, found in chalk-pits about the Chiltern, in Oxfordshire, and elsewhere, being in reality a kind of pyrites, or indigested iron-ore.

IRON-shot, in *Mineralogy*, is a term applied by Mr. Jameson (*Geognos.* vol. iii. p. 47. 159.) to such rocks and stones as are coloured or clouded by the oxyds of iron. Ferruginous is a more common name for this very common appearance in the strata.

IRON-sick, a *Nautical Term*, signifying the decay of the iron fastenings by its corrosion with the sea-water, by which the continuity of the parts is gnawed away by degrees, whereby the vessel is not only rendered weak, but leaky.

IRON-stone, is that species of iron ore which abounds with a considerable proportion of earth, such as lime, or alumine, and is the ore most common in this country. See *IRON*.

The manner of getting iron-stone is divided into three departments: 1. By *stall-work*: 2. By *bell-pits*: and 3. By *open-work*. The first of these methods is employed when the stone lies at a considerable depth. After sinking a shaft to the lower part of the stratum, the ground is excavated in an horizontal direction, leaving at intervals certain parts standing to support the roof of the excavation. The spaces between these pillars are called *stalls*.

The *bell-pit* is employed when the iron-stone lies at some distance from the surface, and where the ground is not sufficiently firm to admit of stall-work. These pits, when first opened, are narrow, but become wider below, assuming the shape of a bell.

The third method, or the *open-work*, is made use of when the stratum containing the stone is nearly baffeting, or is very near to the surface. The earth is first removed, laying the stratum containing the ore bare, and the stone is got out as from an open quarry.

The argillaceous iron ores are generally called iron-stones, and abound in many of the coal districts. In Mr. Farey's *Agricultural and Mineral Report on Derbyshire*, vol. i. p. 217, a list of seventy-five places in and near that county is given, where iron-stone has been dug, or where the rakes of iron-stone, as they are there called, have been worked.

IRON-wood, in *Botany*. See *SIDEROXYLON*.

IRON-work, in a *Ship*, denotes all the pieces of iron, of whatsoever figure or size, which are used in its construction; as bolts, boom-irons, which are composed of two rings, nearly resembling the figure of 8, nails, spikes, chains, and chain plates, block-strops, cranks, braces, pintles, and goodgings.

IRON-works, a name given to the establishments for the manufacture of pig-iron. (See *BLAST-furnace* and *IRON*.) The most proper situation for iron-works is on the side of a hill, from which a perpendicular descent could be formed nearly equal to the height of the blast-furnace. The upper ground by this means is on a level with the mouth of the furnace, where all the materials are introduced, and is therefore the situation where the ore is roasted, and the cokes prepared; the lower ground being the most proper for the rest of the works.

Where such local advantages do not exist, the materials are drawn up on an artificial inclined plane, by appropriate machinery.

IRON-wort, in *Botany*. See *GALEOPSIS* and *SIDERITIS*.

IRON Island, in *Geography*, a small island in the East Indian sea, near the coast of Siam. N. lat. 12° 35'. E. long. 98°.

IRON Lough, a lake of Ireland, in the county of Westmeath, through which the river Inny passes. It is about five miles N.W. from Mullingar.

IRON Mountains, a chain of American mountains, in Tennessee, extending from the river Tennessee to that of French Broadtown, S.W. to N.E. and constituting the boundary between Tennessee and North Carolina, and reaching from near the lead mines, on the Kanaway, through the Cherokee country, to the south of Chota, and terminating near the source of Mobeile. This chain abounds with caverns and cataracts.

IRONDEQUET, a bay on the south side of lake Ontario.

IRONSIDE, GILBERT, in *Biography*, an English prelate, was born at Hawksbury, in Oxfordshire, in 1588, and educated at Trinity college, Oxford. Soon after he entered upon holy orders, he obtained the rectory of Winterburn, in Dorsetshire. At the restoration he was made bishop of Bristol. He died in 1671. He was author of "Questions on the Sabbath," and a sermon. Wood.

IRONY, derived from *ειρωνια*, *disimulation*, in *Oratory*, a figure in speech, whereby we plainly intend something very different from what our words express; as when we seem to praise a person at a time when we evidently rally and discomfend him.

Quintilian calls this figure *diversiloquium*; *disimulation*, and *illusion*; and observes that it may be known by the manner of the pronunciation, or from the nature of the person or the thing. The subjects of irony are vices and follies of all kinds: and it has thus been used by the most grave persons on proper occasions. Socrates used it so much as to acquire the name of *ειρων*, or the *droll*. It was also used by the pro-

phet Elijah, 1 Kings, xviii. 27, by Solomon, Ecclef. xi. 9, and by our Saviour himself, Mark, vii. 9.

IROQUOIS. See *SIX Nations*.

IROQUOIS, National Music. Claude Perrault, an unbeliever in the harmony or counterpoint of the ancients, tells us, in his "Physical Essays," that Louis XIV., near the end of his reign, when some of the Iroquois nation were brought into France, wishing to hear them sing, that he might form some idea of their music, many of them fung their wild melodies in unisons and octaves, while others accompanied them in grunting like pigs; regularly, however, marking the measure by a violent jolt. And thus they attempered the acute voices by the mixture of the *grave grunts* and rhythmical pulsations of the others.

Perrault imagines, from the description which Cassiodorus gives of harmony, or singing together, which the ancients called *symphony*, that Roman harmony resembled that of the Iroquois.

IRRADIATION, signifies an emanation or shooting out of rays, or subtle effluvia, from any body. See **EMANATION**, **RAY**, **EFFLUVIA**, and **QUALITY**.

IRRATIONAL NUMBERS, the same as *surd numbers*. See **SURD** and **NUMBERS**.

IRRATIONAL Quantities. See **RATIONAL Quantities**.

IRRATIONAL Soul. See **SOUL**.

IRREDUCIBLE CASE, in *Algebra*, is an expression arising from the solution of certain equations of the third degree, which always appears under an imaginary form, notwithstanding it is, in fact, a real quantity, but the reduction of it to a rational, or irrational finite expression, has at present resisted the united efforts of many of the most celebrated mathematicians of Europe. Every cubic equation may be reduced to the form $x^3 + ax = b$; and then, according to the common rule,

$$x = \sqrt[3]{\frac{b}{2} + \sqrt{\frac{b^2}{4} + \frac{a^3}{27}}} + \sqrt[3]{\frac{b}{2} - \sqrt{\frac{b^2}{4} + \frac{a^3}{27}}}.$$

See **EQUATIONS**.

Now, when a is negative, $\frac{a^3}{27}$ is also negative; and, therefore, when $\frac{b^2}{4} < \frac{a^3}{27}$, the quantity under the inferior radical,

viz. $\sqrt{\frac{b^2}{4} - \frac{a^3}{27}}$, is imaginary; because we cannot extract the square root of a negative quantity; and this is what constitutes that which is generally called the irreducible case.

This difficulty soon presented itself to Cardan, after Tartalea had communicated to him his method for the solution of cubic equations, which rule is now commonly, though very improperly, attributed to the former. Cardan informs Tartalea, in a letter dated August 4th, 1539, that he understood the solution of the equation $x^3 + ax = b$, and

also of $x^3 - ax = b$, when $\frac{b^2}{4} > \frac{a^3}{27}$; but when $\frac{b^2}{4} < \frac{a^3}{27}$,

his attempts always failed; and he therefore begged of Tartalea to clear up his difficulty, by sending him the solution of the equation $x^3 - 9x = 10$. Tartalea was himself perfectly aware of this difficulty, but he was by no means satisfied with Cardan's conduct, whom he at that time suspected to be about publishing as his own the rules he had taught him; and, therefore, instead of giving him an explicit answer, he writes to him in the following terms.—"M. Hieronime, I have received your letter, in which you write, that you understand the rule for the case $x^3 - ax = b$,

when $\frac{b^2}{4}$ is greater than $\frac{a^3}{27}$, but when $\frac{a^3}{27}$ exceeds $\frac{b^2}{4}$, you

cannot resolve the equation; and, therefore, you request me to send you the solution of the equation $x^3 - 9x = 10$. To which I reply, that you have not used a good method in that case, and that your whole process is entirely false. As to resolving you the equation you have sent, I must say that I am very sorry that I have already given you so much as I have done; for I have been informed by a credible person, that you are about to publish another algebraical work, and that you have been boasting through Milan of having discovered some new rules in algebra. But take notice, that if you break your faith with me, I shall certainly keep my word with you, nay, I even assure you to do more than I promised." (Dr. Hutton's Mathematical Dictionary, article **ALGEBRA**.) Tartalea, however, notwithstanding what he says in this letter, was himself well aware of the difficulty in question, as appears from some of his private memoranda: and from that time to the present, which is near 300 years, the same impediment remains, notwithstanding the repeated attempts of many very distinguished mathematicians; in fact, there is great reason to suppose, independently of the failure of so many ingenious attempts, that the formula is inexpressible in any other finite form, than that under which it naturally arises by the solution. See **EQUATIONS**.

Notwithstanding, however, that no analytical solution can be given to the case in question, every equation of this form has three real roots, which are obtainable by other methods, such as by means of a table of sines and tangents, infinite series, continued fractions, and a new method, lately published by Mr. Barlow in the Mathematical Repository, which seems by far the readiest and most accurate of any that has been at present discovered; the rationale of which is as follows;

1. Every cubic equation may be reduced to the form $x^3 + ax = \pm b$, by the known rules in algebra; but when the equation is in the irreducible case, this ambiguous form ceases, and the equation becomes $x^3 - ax = \pm b$; the solution of which, by the following method, is the same for either sign of b ; only when b is positive, the root first found will be positive, and when b is negative, the root will be negative also; it will, therefore, be sufficient to consider the

case $x^3 - ax = b$, in which $\frac{b^2}{4} < \frac{a^3}{27}$, as we have before seen.

Now, every equation of the form $x^3 - ax = b$, may be transformed to another dependent equation, in which the co-efficient of the second term shall be unity; that is, to

another of the form $y^3 - y = c$. For make $x = \frac{y}{z}$, then the

equation becomes $\frac{y^3}{z^3} - \frac{ay}{z} = b$; or $y^3 - az^2y = bz^3$:

now take $az^2 = 1$, or $z = \sqrt[3]{\frac{1}{a}}$; and, consequently, bz^3

$= \frac{ba^{\frac{2}{3}}}{a^{\frac{1}{3}}}$; whence we have $y^3 - y = \frac{ba^{\frac{2}{3}}}{a^{\frac{1}{3}}}$; or putting $\frac{ba^{\frac{2}{3}}}{a^{\frac{1}{3}}} = c$, it becomes

$y^3 - y = c$, as required.

And the value of y being found in this reduced equation, we immediately obtain that of x , in the original one, by

means of the expression $x = \frac{y}{z}$, or $x = y \sqrt[3]{a}$.

Now, the original equation being by hypothesis of the irreducible form, the transformed equation must necessarily be

IRREDUCIBLE CASE.

so likewise; and, consequently, $\frac{c^3}{4} < \frac{1}{27}$, or $c < \frac{2\sqrt[3]{3}}{9}$, or $c < .38491$; assuming this, therefore, as the maximum value of c , we find that the greatest value of y can never exceed 1.1549, nor can the least be less than unity; so that all possible values of y lie between the limits 1 and 1.1549; and if, therefore, we have a table containing all the values of c to those of y , between the above limits, we shall have by inspection the solution of every equation of the irreducible case, when converted into the form $y^3 - y = c$; and hence also of every irreducible equation of the form $x^3 - ax = b$, because $x = y \sqrt[3]{a}$.

The following is a table of this description, the value of y being arranged in the leading column, except the last digit, which is found in the upper horizontal line, and the respective values of c are found in the other columns, being exactly the form that is usually given to the common tables of logarithms; and the finding of any value of y , corresponding to a given value of c , is performed exactly the same as that of finding the natural number to a given logarithm. Thus, for example, giving $y^3 - y = .3837$ to find y : in the table the number corresponding to .38369912 is 1.1543; that is, $y = 1.1543$. It is obvious, therefore, that, from bare inspection, the value of y may be found true to five places of figures, but these are extended to 8 or 9 places true, by taking proportional parts as in logarithms; thus, find the next greater and less tabular number to that proposed; and then say, as the difference of these is to .0001; so is the difference between the least of them and the number proposed, to the part which is to be added unto the least value of y ; and this proportion may be safely carried to four places at least, and thus the value of y will be known to eight places. This may be demonstrated as follows: the proportional part that is thus added unto y , is always less than .0001, and, therefore, less than the $\frac{1}{10000}$ th part of y , and hence it may be said to be very small with regard to y . Now, I say, that if a and b be both very small with regard to a third quantity y , that the following proportion is very nearly true; viz.

$$\frac{(y+a)^3 - (y+a) - (y^3 - y)}{(y+b)^3 - (y+b) - (y^3 - y)} :: a : b;$$

for, by rejecting all those powers of a and b higher than the first, this proportion becomes precisely

$$(3y^2 - 1)a : (3y^2 - 1)b :: a : b;$$

and since, in this case, a and b are less than .0001, (or at least neither of them ever exceed this,) by rejecting the squares and cubes of these quantities, we cannot have affected the fourth place of figures in the result, and therefore the pro-

portion may always be depended upon to four places. And thus, the following rule may be deduced for every irreducible cubic equation, $x^3 - ax = b$; viz.

Find $\frac{b\sqrt[3]{a}}{a^2}$ in the following table, and take out the corresponding value of y ; then will $y\sqrt[3]{a} = x$ be the root sought. Let us, for instance, take the example proposed by Cardan to Tartalea; namely, $x^3 - 9x = 10$, to find x .

Here $\frac{b\sqrt[3]{a}}{a^2} = \frac{30}{81} = .37037037$.
Tab. n. .37057828, corresp. n. 1.1499137037037 given n.
nextless .37028164 ——— n. 1.1498137028164 less tab.n.

As 29664 : 1 :: 08873 : 2991
Therefore $y = 1.14982991$
 $3 = \sqrt[3]{a}$

and $x = 3.44948973$ as required.

Ex. 2.—Required the value of x in the equation
 $x^3 - 7x = 6$.

First $\frac{6\sqrt[3]{7}}{7^2} = .32396954$;
Tabula n. .32398835, corresp. n. 1.1339 32396954
Next less .32370267, ——— n. 1.1338 32370267

As 28568 : 1 :: 26687 : 9342
Therefore the value of y is 1.13389342;
and $y\sqrt[3]{7} = 1.13389342 \times 2.6457513 =$

2.999999999, as will be found by the operation; which answer is true to the 10th place, the real root being 3, as is obvious from the equation. It will be unnecessary to give any other examples, as the same method is pursued in all cases, and the same accuracy may be depended upon in the results. The reader who will trouble himself to compare the rule here laid down, with any other that has been before given by other writers, will soon be convinced of the immense labour that is saved by the following table; at the same time, that the number of figures in the result are nearly double those that can be safely obtained by the tables of sines and tangents.

For the method of finding the other two roots after one is obtained, see EQUATIONS; for the solution of cubic equations by the trisection of an angle, see Bonnycastle's Trigonometry; and for the method by infinite series, see Philosophical Transactions, vols. lxxviii. and lxx.

IRREDUCIBLE CASE.

Table for the Solution of the Irreducible Case in Cubic Equations.

y	0	1	2	3	4	5	6	7	8	9
1000	00000000	00020003	00040012	00060027	00080048	00100075	00120108	00140147	00160192	00180243
1001	00200300	00220363	00240432	00260507	00280588	00300675	00320768	00340867	00360973	00381084
1002	00401201	00421324	00441453	00461588	00482724	00501876	00522030	00542189	00562354	00582525
1003	00602703	00622886	00643075	00663271	00683472	00703679	00723893	00744112	00764337	00784569
1004	00804806	00825050	00845299	00865555	00885817	00906084	00926358	00946637	00966923	00987215
1005	01007513	01027816	01048126	01068442	01088764	01109092	01129426	01149766	01170112	01190464
1006	01212822	01231186	01251556	01271932	01292314	01312702	01333097	01353497	01373903	01394316
1007	01414734	01435159	01455589	01476026	01496469	01516917	01537372	01557833	01578299	01598772
1008	01619251	01639736	01660227	01680724	01701227	01721736	01742252	01762773	01783300	01803833
1009	01824373	01844918	01865470	01886027	01906591	01927160	01947736	01968318	01988906	02009500
1010	02030106	02050706	02071318	02091936	02112560	02133191	02153827	02174470	02195118	02215773
1011	02236433	02257100	02277772	02298451	02319136	02339827	02360524	02381227	02401936	02422652
1012	02443373	02464100	02484834	02505573	02526319	02547070	02567828	02588592	02609317	02630138
1013	02650920	02671708	02692501	02713302	02734109	02754921	02775740	02796564	02817395	02838232
1014	02859074	02879923	02900778	02921639	02942507	02963380	02984259	03005145	03026036	03046934
1015	03067838	03088747	03109663	03130585	03151513	03172447	03193388	03214334	03235286	03256245
1016	03277210	03298180	03319157	03340140	03361129	03382124	03403152	03424133	03445146	03466166
1017	03487191	03508223	03529261	03550305	03571355	03592411	03613473	03634542	03655611	03676697
1018	03697787	03718876	03739974	03761080	03782190	03803308	03824431	03845561	03866695	03887838
1019	03908986	03930140	03951300	03972466	03993638	04014816	04036001	04057192	04078388	04099591
1020	04120800	04142015	04163236	04184464	04205697	04226937	04248182	04269434	04290692	04311956
1021	04333226	04354502	04375785	04397074	04418368	04439669	04460976	04482289	04503608	04524933
1022	04546265	04567602	04588946	04610296	04631652	04653014	04674382	04695757	04717137	04738524
1023	04759917	04781316	04802721	04824132	04845549	04866973	04888402	04909838	04931280	04952728
1024	04974182	04995643	05017109	05038582	05060061	05081546	05103036	05124534	05146037	05167547
1025	05189063	05210584	05232112	05253646	05275187	05296733	05318286	05339844	05361409	05382980
1026	05404558	05426141	05447730	05469326	05490928	05512534	05534150	05555770	05577397	05599030
1027	05620668	05642313	05663964	05685622	05707285	05728955	05750630	05772312	05794000	05815695
1028	05837395	05859102	05880815	05902534	05924259	05945990	05967727	05989471	06011221	06032977
1029	06054759	06076507	06098282	06120062	06141849	06163642	06185441	06207247	06229058	06250876
1030	06270000	06294530	06316366	06348209	06360057	06381912	06403773	06425640	06447514	06469393
1031	06491279	06513171	06535069	06556973	06578884	06600800	06622723	06644653	06666588	06688529
1032	06710477	06732431	06754391	06776357	06798329	06820308	06842293	06864284	06886281	06908284
1033	06930294	06952309	06974331	06996360	07018394	07040435	07062481	07084534	07106593	07128659
1034	07150730	07172808	07194892	07216982	07239079	07261181	07283290	07305405	07327526	07349654
1035	07371788	07393927	07416073	07438226	07460384	07482549	07504720	07526897	07549080	07571267
1036	07593456	07615668	07637876	07660090	07682311	07704538	07726771	07749010	07771256	07793597
1037	07815765	07838029	07860300	07882577	07904859	07927148	07949444	07971745	07994053	08016367
1038	08038687	08061014	08083346	08105688	08128030	08150382	08172739	08195103	08217473	08239849
1039	08262232	08284621	08307016	08329417	08351824	08374238	08396658	08419084	08441516	08463955
1040	08486400	08508851	08531308	08553772	08576242	08598718	08621200	08643689	08666184	08688685
1041	08711192	08733705	08756225	08778751	08801284	08823822	08846367	08868918	08891475	08914039
1042	08936609	08959185	08981767	09004356	09026951	09049552	09072159	09094772	09117393	09140018
1043	09162651	09185289	09207934	09230585	09253243	09275906	09298576	09321252	09343935	09366623
1044	09389318	09412020	09434727	09457441	09480161	09502847	09525627	09548358	09571103	09593855
1045	09616613	09639376	09662147	09684923	09707706	09730495	09753290	09776091	09798900	09821713
1046	09844534	09867360	09890193	09913032	09935878	09958729	09981587	10004452	10027322	10050199
1047	10073082	10095972	10118867	10141769	10164678	10187592	10210513	10233440	10256374	10279313
1048	10302259	10325211	10348170	10371135	10394106	10417083	10440067	10463057	10486053	10509056
1049	10532065	10555080	10578101	10601129	10624163	10647204	10670250	10693303	10716363	10739428
1050	10762500	10785578	10808663	10831753	10854850	10877954	10901063	10924179	10947301	10970430

IRREDUCIBLE CASE.

Table for the Solution of the Irreducible Cafe in Cubic Equations.

y	0	1	2	3	4	5	6	7	8	9
1051	10993565	11016706	11039954	11063008	11086168	11109334	11132507	11155686	11178871	11202063
1052	11225261	11248465	11271676	11294896	11318116	11341345	11364581	11387823	11411072	11434327
1053	11457588	11480855	11504129	11527409	11550695	11573988	11597287	11620592	11643904	11667222
1054	11690546	11713877	11737214	11760557	11783907	11807263	11830625	11853994	11877369	11900750
1055	11924138	11947531	11970932	11994338	12017751	12041170	12064596	12088028	12111466	12134911
1056	12158362	12181819	12205282	12228752	12252229	12275711	12299200	12322695	12346197	12369705
1057	12393219	12416740	12440267	12463800	12487340	12510886	12534438	12557997	12581562	12605135
1058	12628711	12652295	12675886	12699483	12723086	12746695	12770311	12793933	12817562	12841197
1059	12864838	12888486	12912139	12935800	12959466	12983139	13006819	13030505	13054197	13077895
1060	13101600	13125311	13149029	13172753	13196483	13220220	13243963	13267712	13291468	13315230
1061	13338998	13362773	13386554	13410342	13434136	13457936	13481742	13505556	13529375	13553201
1062	13577033	13600871	13624716	13648567	13672425	13696289	13720159	13744036	13767919	13791809
1063	13815705	13839607	13863516	13887431	13911352	13935280	13959214	13983154	14007101	14031055
1064	14055014	14078980	14102953	14126932	14150917	14174909	14198907	14222911	14246922	14270939
1065	14294963	14318992	14343029	14367072	14391121	14415176	14439238	14463306	14487381	14511462
1066	14535550	14559643	14583744	14607850	14631963	14656083	14680209	14704341	14728480	14752625
1067	14776776	14800934	14825098	14849269	14873446	14897630	14921820	14946016	14970219	14994428
1068	15018643	15042865	15067093	15091328	15115569	15139817	15164071	15188331	15212598	15236871
1069	15261151	15285437	15309729	15334028	15358334	15382645	15406963	15431288	15455619	15479956
1070	15504300	15528650	15553007	15577370	15601739	15626115	15650498	15674886	15699285	15723683
1071	15748091	15772506	15796926	15821354	15845787	15870228	15894674	15919127	15943587	15968052
1072	15992525	16017004	16041489	16065980	16090478	16114983	16139494	16164011	16188535	16213065
1073	16237602	16262145	16286694	16311250	16335813	16360382	16384957	16409539	16434127	16458721
1074	16483322	16507930	16532544	16557164	16581791	16606424	16631064	16655710	16680363	16705022
1075	16729688	16754359	16779038	16803723	16828414	16853112	16877816	16902527	16927244	16951968
1076	16976698	17001434	17026177	17050926	17075682	17100445	17125214	17149989	17174770	17199559
1077	17224353	17249154	17273962	17298776	17323596	17348423	17373257	17398097	17422943	17447796
1078	17472655	17497521	17522393	17547272	17572157	17597049	17621947	17646851	17671762	17696680
1079	17721604	17746534	17771471	17796415	17821365	17846321	17871284	17896253	17921229	17946211
1080	17971200	17996195	18021197	18046201	18071220	18096241	18121269	18146303	18171343	18196391
1081	18221444	18246504	18271571	18296644	18321723	18346809	18371902	18397001	18422106	18447218
1082	18472337	18497462	18522593	18547731	18572876	18598027	18623184	18648348	18673518	18698695
1083	18723879	18749069	18774265	18799468	18824677	18849893	18875116	18900345	18925580	18950822
1084	18976070	19001325	19026587	19051855	19077129	19102410	19127698	19152992	19178292	19203560
1085	19228913	19254233	19279559	19304892	19330232	19355578	19380930	19406289	19431655	19457027
1086	19482406	19507791	19533182	19558581	19583986	19609396	19634814	19660238	19685669	19711106
1087	19736550	19762001	19787457	19812921	19838391	19863867	19889350	19914840	19940336	19965838
1088	19979135	20004686	20030245	20055814	20081399	20106990	20132586	20158189	20183799	20209412
1089	20246797	20272378	20297965	20323559	20349160	20374767	20400380	20426000	20451627	20477260
1090	20502900	20528546	20554200	20579858	20605524	20631197	20656876	20682561	20708253	20733952
1091	20759657	20785369	20811087	20836812	20862543	20888281	20914026	20939777	20965534	20991298
1092	21017069	21042846	21068630	21094420	21120217	21146020	21171830	21197647	21223470	21249300
1093	21275136	21300978	21326828	21352684	21378546	21404415	21430291	21456173	21482061	21507957
1094	21533858	21559767	21585682	21611603	21637531	21663466	21689407	21715355	21741309	21767270
1095	21793238	21819212	21845192	21871179	21897173	21923173	21949180	21975194	22001214	22027240
1096	22053274	22079313	22105360	22131413	22157472	22183538	22209611	22235690	22261776	22287868
1097	22313967	22340073	22366185	22392304	22418429	22444561	22470699	22496844	22522996	22549154
1098	22575319	22601491	22627669	22653853	22680044	22706242	22732447	22758657	22784873	22811099
1099	22837330	22863567	22889811	22916062	22942319	22968582	22994853	23021130	23047413	23073703
1100	23100000	23126303	23152613	23178930	23205253	23231583	23257919	23284262	23310611	23336967
1101	23363330	23389700	23416075	23442458	23468847	23495243	23521645	23548054	23574470	23600892
1102	23627321	23653756	23680198	23706647	23733102	23759564	23786033	23812508	23838989	23865478

IRREDUCIBLE CASE.

Table for the Solution of the Irreducible Cafe in Cubic Equations.

y	0	1	2	3	4	5	6	7	8	9
1103	27901973	23918474	23944982	23971497	23998019	24024547	24051081	24077623	24104171	24130725
1104	24157286	24183354	24210429	24237010	24263597	24290192	24316792	24343400	24370014	24396635
1105	24423263	24449897	24476537	24503185	24529839	24556499	24583166	24609840	24636521	24663208
1106	24689902	24716602	24743309	24770023	24796743	24823490	24850204	24876944	24903691	24930444
1107	24957204	24983971	25010745	25037525	25064311	25091105	25117905	25144711	25171525	25198345
1108	25225171	25252004	25278844	25305691	25332544	25359404	25386270	25413144	25440023	25466910
1109	25493803	25520703	25547609	25574522	25601442	25628368	25655301	25682241	25709187	25736140
1110	25763100	25790066	25817039	25844019	25871001	25897998	25924998	25952004	25979017	26006037
1111	26033063	26060096	26087136	26114182	26141235	26168295	26195361	26222434	26249514	26276600
1112	26303693	26330792	26357899	26385012	26412131	26439258	26466391	26493531	26520677	26547830
1113	26574990	26602156	26639239	26676309	26713389	26750476	26787568	26824666	26861769	26898878
1114	2684954	26874188	26901428	26928674	26955927	26983187	27010454	27037727	27065007	27092294
1115	27119588	27146888	27174194	27201508	27228828	27256159	27283488	27310829	27338176	27365529
1116	27392890	27420257	27447630	27475011	27502398	27529792	27557192	27584599	27612013	27639434
1117	27666861	27694295	27721736	27749183	27776638	27804098	27831566	27859040	27886521	27914009
1118	27941503	27969004	27996512	28024027	28051548	28079076	28106610	28134152	28161700	28189254
1119	28216816	28244384	28271959	28299541	28327129	28354724	28382326	28409934	28437549	28465171
1120	28492800	28520435	28548077	28575726	28603382	28631044	28658713	28686389	28714071	28741760
1121	28769456	28797159	28824868	28852584	28880307	28908036	28935773	28963516	28991265	29019022
1122	29046784	29074555	29102331	29130115	29157905	29185702	29213505	29241315	29269132	29296956
1123	29324787	29352624	29380468	29408319	29436176	29464040	29491911	29519789	29547673	29575564
1124	29603462	29631367	29659278	29687197	29715121	29743053	29770991	29798937	29826888	29854847
1125	29882813	29910785	29938764	29966749	29994742	30022741	30050747	30078759	30106779	30134805
1126	30162838	30190877	30218924	30246977	30275037	30303103	30331177	30359257	30387344	30415438
1127	30443538	30471646	30499760	30527880	30556008	30584142	30612283	30640431	30668586	30696747
1128	30724915	30753090	30781272	30809460	30837655	30865857	30894066	30922282	30950504	30978733
1129	31006969	31035212	31063461	31091717	31119980	31148250	31176526	31204810	31233100	31261396
1130	31289700	31318010	31346328	31374652	31402982	31431320	31459664	31488015	31516373	31544738
1131	31573109	31601487	31629872	31658264	31686663	31715068	31743480	31771899	31800325	31828757
1132	31857197	31885643	31914096	31942556	31971022	31999495	32027975	32056462	32084956	32113456
1133	32141964	32170478	32198999	32227526	32256061	32284602	32313150	32341705	32370267	32398835
1134	32427410	32455992	32484581	32513177	32541780	32570389	32599005	32627628	32656258	32684894
1135	32713538	32742188	32770845	32799508	32828179	32856856	32885541	32914232	32942929	32971624
1136	33000346	33029064	33057789	33086521	33115260	33144005	33172758	33201517	33230283	33259056
1137	33287835	33316622	33345415	33374215	33403022	33431836	33460657	33489484	33518318	33547159
1138	33576007	33604862	33633723	33662592	33691467	33720349	33749238	33778134	33807036	33835946
1139	33864862	33893785	33922715	33951652	33980595	34009545	34038503	34067467	34096438	34125415
1140	34154400	34183391	34212390	34241395	34270407	34299426	34328451	34357484	34386523	34415569
1141	34444622	34473682	34502749	34531822	34560903	34589990	34619084	34648185	34677293	34706407
1142	34755529	34784657	34813792	34842934	34872083	34881239	34910402	34939571	34968747	34997931
1143	35027121	35056318	35085521	35114732	35143949	35173174	35202405	35231643	35260888	35290140
1144	35319398	35348664	35377936	35407216	35436502	35465795	35495094	35524401	35553715	35583035
1145	35612363	35641697	35671038	35700386	35729740	35759102	35788471	35817846	35847228	35876618
1146	35906014	35935417	35964826	35994243	36023667	36053097	36082534	36111978	36141430	36170887
1147	36200352	36229824	36259303	36288788	36318280	36347780	36377286	36406799	36436319	36465846
1148	36495379	36524920	36554467	36584022	36613583	36643151	36672726	36702308	36731897	36761492
1149	36791095	36820704	36850321	36879944	36909574	36939211	36968855	36998506	37028164	37057828
1150	37087500	37117178	37146864	37176556	37206255	37235961	37265674	37295394	37325121	37354855
1151	37384595	37414343	37444097	37473858	37503626	37533402	37563184	37592973	37622768	37652571
1152	37682380	37712197	37742021	37771851	37801689	37831533	37861384	37891242	37921107	37950979
1153	37980858	38010743	38040636	38070536	38100442	38130356	38160276	38190203	38220137	38250078
1154	38280026	38309981	38339943	38369912	38399888	38429870	38459860	38489856	38519860	38549870

IRREGOLARE, *Ital.* in *Ecclesiastical Music*. Modes are called irregular in canto fermo, when the compass is extended beyond its usual limits, or its regular scale is in some unusual manner, violated.

A cadence, or close, used to be termed irregular when the harmony did not close on the key note. (See *Disappointed CADENCE*.) But Rameau has given this title to a particular cadence of his own system, in which the fundamental base rises a 5th, or falls a 4th after the chord of the $\frac{5}{4}$ to the 4th of the key. See *CADENCE*.

IRREGULAR, something that deviates from the common forms or rules.

Thus we say, an irregular fortification, an irregular building, &c. See *BUILDING*, *FORTIFICATION*, *BASTION*, and *PLACE*.

IRREGULAR Figure, in *Geometry*, is that whose sides and angles are not equal. See *REGULAR*.

IRREGULARS, in *Grammar*, are such inflexions of words as vary from the general rule, or pattern.

IRREGULAR, among the *Casuits*, is applied to a person who is unqualified for entering into orders, as being a bastard, maimed, &c. or to an ecclesiastic, who is interdicted, suspended, or censured, and by that means rendered incapable of holding a benefice, or discharging any of the sacred functions.

IRREGULAR Bodies, are solids not terminated by equal and similar surfaces.

IRREGULAR, in the *Art of Building*, is applied not only to the parts of an edifice which deviate from the proportions established by antique monuments, and confirmed by architects; as when a Doric column is made nine modules high, or a Corinthian eleven; but also to the places and figures of buildings, where the angles and sides are made unequal, as in most of the ancient castles; where, without any necessity or confinement from the situation, they effected such irregularity.

A column is also said to be irregular, not only when it deviates from the proportions of any of the five orders, but when its ornaments, whether in the shaft, or the capital, are absurd and ill chosen.

IRREGULAR Leap, in *Music*. See *LEAP*.

IRREGULAR Temperament, or irregular douzeaves, or systems of twelve notes in the octave, are such as have more than two kinds of tempered fifths, or where the wolf, resulting or bearing fifth, does not fall between $\sharp G$ and $b E$, as Mr. Farey has shewn in the *Phil. Mag.* vol. xxxvi. p. 39 and 47. The systems of lord Stanhope. M. Kirnberger, Mr. Hawke's douzeave, and many others, are irregular systems: a former division of the systems of temperament used to be into equal and unequal, but as there could be but *one* equal temperament, such a division answered little purpose: the equal temperament is a regular douzeave, wherein the wolf is equal to each of the temperaments of the fifths, as shewn in the 6th scholium, in Mr. Farey's paper above referred to.

IRREGULAR Diatonic Intervals, are such as, when expressed in any notation by three very small other intervals, and arranged in a table, do not increase pretty regularly in each of their three terms.

IRREGULAR Measures, in *Mining*, are variable measures or strata in thickness, sometimes called *Girdles* (see that article); and according to Mr. William Martin (*Outlines*, p. 171.) include also strata that take a different direction in their dip from that of their attendant strata: in which latter case, we apprehend, that observers have mostly overlooked some *fault* which ranges between the irregular strata and their attendant strata, and have detached and altered

their positions, or that the stratula, or folia (of which this author takes no notice), that often cross beds of stone oblique to their strata-seams or way-boards, have been mistaken for the latter, as often has happened. Numerous instances of variable or irregular measures have been noticed by Mr. Farey in his Survey of Derbyshire and its Environs, and are particularized in his *Agricultural and Mineral Report* to the Board of Agriculture, vol. i. p. 176. 238. 276, &c. Others have been observed by Mr. James Keir, in Shaw's History of Staffordshire; and in Mr. Westgarth Forster's Treatise on a section of strata. They are indeed very important geological phenomena.

IRREGULARITIES in the *Moon's Motion*. See *MOON*.

IRREPLEVIABLE RETURN. See *RETURN*.

IRREPLEVIABLE, or **IRREPLEVISABLE**, in *Common Law*, signifies what may not be replevied, or set at large upon sureties.

IRRIGATION; in *Agriculture*, the art of covering meadow or grass-lands with water, so as to render them more highly productive and beneficial. It may be noticed, that there are two methods of effecting improvements on lands by covering them with water; one of which is by applying it so as to cover the surface when in the state of grass or sward; the other by communicating it to the soil of such grounds as have been broken by means of cultivation. The first is the method that has been principally introduced into practice in this kingdom, and which, by a late writer, has been termed the "European practice of irrigation." But though the history of the origin of this means of improvement is involved in much difficulty, and not capable of being easily traced; it was probably introduced at a very early period from eastern countries, where the practice of covering the lands with water, in order to protect them from the injurious effects of excessive heat, has prevailed for ages; yet by some it is thought to have been brought to the attention of the farmer in this country in another way, for the benefit of natural floods, to the grass-lands which they occasionally overflowed, being evident; and in some instances great, the means of producing artificial floods, and of spreading them over lands, not liable in their natural situation to be overflowed, would become, of course, it is supposed, a desirable object. And that as the most obvious effect of floods, or the overflowings of rivers and brooks on the lands over which they spread, is that of depositing their feculent particles; thereby operating as a vehicle of manure; it is likewise evident to common observation, that foul waters, as those of floods, let fall their feculencies, most freely, in a *stagnant state*. Further, that "it is also equally evident, that the state of stagnation of the waters of floods, or a state that approaches it, is caused by some obstruction of the current below the place of stagnation." And that "from these circumstances being seen, and they could not well be missed by any one who gave the subject a second thought, the means of manuring lands with water, artificially, were given;" in situations it is meant which would admit of the requisite obstructions." And it is further suggested, that "the bottoms, dips, or vallies, which abound, more or less, in every part of the kingdom, would naturally be the most apt subjects for flooding artificially with foul waters, on the principle of manuring the land with their sediment." For on "a bank, or dam, being made across the valley, below the part to be manured, the rivulet which generally accompanies a valley of this kind, especially after heavy rains, the only time when flooding on this principle could be practised, would of course be obstructed; and its waters, fouled, perhaps, with the richest particles-

particles of arable lands, be spread over the bottom of the valley, to an extent proportioned to the height of the bank, and its own flatness: a valve or flood-gate being fixed in the bed of the rivulet to let off the waters, when the *whole* of their foulnesses were deposited: thus gaining a principal advantage over natural flooding; in which the grosser particles only are let fall; the finer, and perhaps most valuable escaping to the river, and thence to the sea, before they be precipitated or let fall upon the land." It is conceived that on these principles, it is evident, some of the meadowlands of the midland districts have formerly been flooded; and that it is not probable, that so evident a method of improving meadow-lands should have been confined to a particular district; but may have been common to other parts of the island. And it is further stated by the same writer, that the *ancient* method of meliorating grass-lands, by the means of *stagnant* water, could no longer prevail, than until the superior effects of running water, on such lands, were discovered and ascertained. And that this important discovery must have been made by *observation*, on the comparative effects of running and standing water, in the natural and artificial flooding spoken of above; and must have been ascertained by a long course of *experience*: as it is not likely that *reason* should have had any share in striking out the modern method of improving grass-lands by running water. For even now, when the reality of the improvement appears to be fully established, there seems to be no full or satisfactory *theory* to account for it: though many of the effects thus produced have lately been more clearly explained and better understood, as will be seen below. The *warmth*, communicated by running water to the grass it flows over, is one great reason adduced for the good effect of running water on this sort of land. But even after this discovery was made, and the effect fully established, it would be some length of time before the art arrived at its present high degree of perfection. As it may, in its present state, be safely deemed the most useful and scientific operation, that has entered into the common practice of husbandry. And the memory of the inventor, or inventors, deserves the highest praise and admiration.

It has likewise been remarked, that the great degree of verdure and luxuriance which almost immediately succeeds the occasional covering of grass-lands with water, sufficiently demonstrates the power which it possesses in promoting vegetation; and that it is a means of fertility that has been employed for ages in more warm climates, with the most beneficial consequences in increasing the quantity of vegetable produce. But that although it has been long in use in other countries, and of late more particularly attended to in this, the principle on which it produces its effects are not yet fully explained.

In considering manure as the nourishment or food of plants, some of the properties of water, that may be beneficial in the vegetable economy when absorbed or taken up by the fibrous roots of plants, have been mentioned; and there are other ways in which it may be advantageous in forwarding the growth of grass herbage when applied over the surface. It is conceived that in climates where the heat is considerable, it may be of much utility, not only by keeping the fine fibrous roots of the grass or other plants in a moist patulous state, the most proper for the purposes of absorption, but in such a temperature or state of heat, from the cooling effect produced by the constant evaporation that is taking place near the surface of the ground, as is the most suitable for their healthy and vigorous growth. It is probably in this way that garden plants are principally benefited by the application of water in the hot summer seasons in our own

climate; as when the waterings are not constantly kept up injury rather than good is mostly experienced. But that another and more beneficial way in which grass produce may be immediately increased, and the fertility of the lands more permanently improved in this country by the floating or covering them with water, is from the waters of the rivers or brooks that are turned upon them, containing, either in the state of solution or diffusion, a variety of different sorts of enriching materials which they gradually and evenly deposit upon the surface while they rest upon or slowly flow over it. This must, it is imagined, be the case in all those instances where the rivers or streamlets either *arise* in, or in their course flow through or over beds of chalk, marl, or other calcareous strata; as in their passage they become highly impregnated with the fine particles of these different substances. And where they are fed by the small runlets which receive the waters that proceed from the higher and more elevated lands, they must often, especially after heavy rain, be loaded with a large proportion of fine rich materials of the animal, vegetable, or other kinds, which they deposit in a regular manner in their tardy trickling course over the surfaces of the fields below.

It would appear that waters thus impregnated produce the most beneficial effects, particularly when not in flood, upon the lands that are the nearest to the sources whence they become principally impregnated with their fertilizing principles; as when they have flowed to some distance they have, in a great measure, deposited and let fall such enriching substances, and are become too pure for affording advantage in the way of deposition. It is only in the time of floods that they can produce much utility in this way at any great distance. It was found by an able philosophical writer, Dr. Darwin, that the water of the Derwent, though it flows for several miles near Matlock, through calcareous strata, contained no impregnation of this sort on its reaching Derby, although the springs in that neighbourhood had a large proportion of it in their composition. And the same author has ingeniously suggested another mode in which water may prove serviceable in floating grounds in this climate, which is that already stated of protecting the grass or other plants from the too severe effects of cold during the winter, or early spring season. In this view it is observed, that the water of strong springs, which in this country have constantly the temperature of forty-eight degrees of Fahrenheit's thermometer, is to be preferred to that of rivers, where it can be procured in a sufficient proportion, as the degree of cold in these is in the same ratio with that of the atmosphere, till it declines to the freezing point, or that of thirty-two. Though both, when spread out, forming a thin sheet of ice on the surface of the land, are beneficial in defending the roots of the grass plants from too intense degrees of cold, and of thus preserving them in a more healthy condition; and it is added, that those of some sorts of grasses are supposed even to vegetate beneath the ice, as the rein-deer moss in Siberia mostly vegetates beneath the snow, in a degree of heat of about forty, which is the medium between that of the inferior surface of the dissolving snow, or that of thirty-two, and that of the common heat of the internal parts of the earth, which is forty-eight; and in this manner the grass produce in this cold country be considerably increased, so as, under proper management, to nearly double the usual annual quantity under other circumstances.

In further illustration of these principles it may be observed, that the water issuing from springs where they abound with particles of gravel, or a stony, mouldering kind of rock, containing a large proportion of calcareous earth, are known from experience to be better adapted to the purpose

IRRIGATION.

poor than that which arises from others that do not contain such materials. The difference in the effects, often so visibly produced, has been accounted for, from watering one field from a spring issuing out of a chalky soil, over those which take their rise in another, similar in every respect and management, except that the water applied arises in, or flows through, a swamp or morass, composed chiefly of peat earth, or proceeds from situations known to contain none of these substances. However, the fact is unquestionably established, that the water of rivers which run through comparatively level and fertile countries, is not only better than that of such as have their courses through mountainous, unproductive tracts, but superior to all others, as every different streamlet adds a new accession of fertilizing materials, which, being dispersed over the surface of the meadows, in their fine and attenuated state, cannot avoid adding a considerable degree of improvement to the lands.

It is conceived by Mr. Marshall, that if the art, as it now stands, were struck out on principle, it must have been on that of animal circulation; to which the operation of meliorating grass-lands with water, through the means of floats and drains, is perfectly analogous. The floats are arteries, conveying the circulating fluid to every part of the subject, imbuing every atom: the drains, veins, collecting the scattered fluid, and conveying it back to its natural channel. But that, in less figurative language, the floats may be considered as trenches, receiving, by the means of flood-gates, as occasion requires, the water of a river, brook, or rivulet, and conveying it along the upper margin, and upon the tops of the natural or artificial swells of the field of improvement:—the drains, counter-trenches, stretching along the lower margin, and winding in the dips and hollows, to receive the waters spread over the surface by the floats.

Each set of trenches, whether of floats or drains, bears more or less resemblance to a tree, with its trunk and branches: the branches of the floats increasing in number, and diminishing in size, as they proceed from the river or other source; those of the drains, on the contrary, diminishing in number, and increasing in size, as they approach the receptacle or place at which the water is to be discharged. And it is further remarked, that when the water is at work, as it is properly enough termed, the entire surface, supposing the operation to be perfect, is covered with one continued sheet of living *water*, purling slowly and evenly over every part, an inch or more deep. If the grass be very short, the water is seen, and has a beautiful as well as a profitable effect: if not, it steals, unseen, among the herbage, or shews itself, partially: it being impossible, in practice, to render the sheet throughout of an uniform depth or thickness, as it must naturally pass off quicker in some situations than others.

From this general idea of the method of watering grass-lands, on the modern principle, it is clearly shewn that a dead flat, a perfect level, is, of all others, the least adapted to the practice. A perfect level, however, seldom occurs in nature; inequalities, sufficiently to promote a circulation of water on the turf surface, may generally be discovered, if judiciously sought. In the midland counties, Mr. Marshall has seen in the practice of a superior manager a beautifully simple expedient practised, to find out the inequalities of a piece of ground nearly flat: which is that of covering it with water, and preserving the level by the means of leveling pegs, stumps or piles driven down in various parts to a level with the surface of the water; so that, after the water was let off, the level still remained. The parts last covered were, of course, the proper ground for the floats; the parts left freed for the drains; art being used, where wanted, to

give additional advantage to the natural inequalities which may be present. But situations in general (water-formed lands excepted), abound, he thinks, sufficiently with inequalities of surface: either natural, as the swells and hollows of lands, lying out of the way of floods, and having never been ploughed; or artificial, as those which have been raised by the plough into ridge and furrow: in this case the ridges receive the floats, the furrows the drains: in that, the plummet is the guide to the floats; the water they throw out, to the drains or cuts to be formed.

The same writer adds, that, in the above district, he has seen the side of a hill watered with rain-water, from a road running along the top of it: the same trench, in this case, acting as float and drain, running a zig-zag along the face of the slope, the lower folds catching the water spread out by the upper; and that he has likewise observed several instances of ridges and furrows being watered from similar sources. In these cases, whether the natural descent of the lands was little or great, the floats were opened upon the ridges with clods of turf cut out of the trenches, placed at distances proportioned to the descent, to check the current sufficiently, to force the water out of the trench above, yet leaving it a sufficient passage, to suffer it to carry down a supply to the parts below. He has also met with one or more instances in which ridges and furrows have been levelled at an excessive cost, by paring off the turf, throwing down the ridges by hand, and replacing the turf, giving the surface one regular gentle descent; and this, notwithstanding it is allowed by those who may be styled masters in the art, that the quicker the circulation the more beneficial the effect. Upon the whole, it appears pretty evident, that the operation, though scientific, can seldom be rendered mechanical. Straight lines and plain surfaces can seldom be had, but at a great, and, frequently, an unnecessary expence. The given situation of the ground should be consulted and maturely studied before the work be set about. Every scite may be said to require a different arrangement of trenches. Of course, no man ought to set about a work of so difficult a nature until he has studied its principles, and made himself master of its theory; nor then, without the assistance of practice in himself, or others whom he can employ for the purpose.

It is conceived that to expatiate on the utility of watering grass-lands would be a waste of words. In situations where a sufficient supply of water, of a fertilizing quality, can be commanded at all seasons, it ranks indubitably among the highest class of improvements. Much, however, it is supposed, depends on the quality of the water; not on its colour or clearness, but the specific quality of the suspended particles. Waters, in their natural state (not purified by distillation), more especially spring waters, though perfectly transparent and pure to the eye, are as various in quality as soils, owing to earthy and other particles being suspended in them imperceptibly to the eye, requiring the aid of chemistry to detect them; hence hard water, soft water, wholesome waters, medicinal waters, &c. The effects of clear spring water have been found strikingly evident in various cases of this sort of management in different places in this country.

But although very much depends on the quality of water for the purpose of meliorating grass-lands, much also depends on the quantity; on having a sufficient supply at all seasons. With this there are, perhaps, few waters which might not be rendered beneficial to grass-land, if thrown over it at proper seasons, and in proper quantity. Without it, the benefit, it is possible, may not be adequate to the expence. The most obvious advantage of watering grass-

lands, it is conceived, arises in a dry season; and if the supply fail in such seasons, as frequently happens in many situations, the intention is in part frustrated; the winter and early spring waterings being in this case all that can be commanded for the purpose. This is given by way of caution; not as a discouragement to the practice. There are, it is well observed, in this island, situations innumerable, in which the advantages arising from the practice, properly conducted, would far exceed the expence of obtaining them; and to ascertain them is an object of the first magnitude to the owners and occupiers of grass-lands, and in many instances, probably in those of the arable kind likewise.

Hence it may be safely concluded, that this mode of improving grass, or other lands, where it can be had recourse to, is of the greatest importance, and of the most valuable kind; and it is probably capable of being applied in a greatly more extensive manner than has yet been the case, by the persons employed in conducting the business fully availing themselves of the various occasional falls of rivers, streams, and, in particular seasons, of canals, as in this way water may often be provided for the purpose of distributing over extensive tracts of land that have hitherto been thought incapable of admitting of such means of melioration and improvement. In other circumstances and situations, by having recourse to damming up the water, and the occasional use of wooden pipes in the conveying it where necessary, it may be easily raised to heights sufficient for conducting it over many elevated lands, and by such means promote their vegetation and produce to a degree that cannot be easily calculated or conceived.

And, from what has been already done in this way, it is evident that, on heathy moors, and other mountainous tracts, it may often be applied with the prospect of great advantage. In traversing such hills, instances are daily occurring of little rivulets or rills, which are insufficient to form a regular course, spreading their waters on particular parts, and thus providing a most beautiful verdure; which affords sufficient proof of what may be effected by the judicious application of water in such situations. The same principles may be applied, in many situations, in conveying the rich liquors collected in ponds and reservoirs about the farm yards and buildings, that are too frequently wasted by evaporation or other means, over the adjoining fields, as has been practised in Cheshire by Mr. Fenna.

To this system of improving grass-lands, the chief objection is, the first expence of the work; but if it be conducted in a judicious manner, and by persons acquainted with the business, this will seldom be so considerable as is commonly supposed, or form any material impediment; as the increase of produce, which is almost immediately the consequence, will amply repay the improver. It has been objected to by some on the ground of cutting the land, but this is of little consequence if additional supplies of food be thereby afforded for the support of live stock, and the gradual improvement of the soil at the same time effected.

It may be stated that winter and spring are the two seasons when grounds of the grass kind are usually irrigated or watered, as from the month of November till the beginning of March. The experience of the operator must, in a great measure, regulate this proceeding as to the length of time they should remain under water. In some districts it is the practice to allow the water to flow over the fields for several weeks together, with only the interval of a day or two occasionally; while in others the custom is to cover them alternately each other week. When frosts set in, the work is usually suspended; but it has been remarked, that

in such cases the succeeding crop of grass is less plentiful. As the spring season advances, much less floating is found to be requisite. However, in every case where floating is performed to advantage, the land should be laid dry between every time of covering it with water.

It has been advised in the beginning to lay the water on in the early part of November, suffering it to overflow from 10 to 14 days, and then taken off; repeating the same process in the two following months; giving in February also two waterings of from five to seven days each; and in March three, of from three to five days each, according to the state of the weather, constantly permitting the water to continue longer upon the land in cool than warm weather; and it is likewise generally advised, that on the sandy, gravelly, and drier kinds of lands, the water should not remain so long at a time as in those of the heavier kinds; and in the latter sorts, Mr. Wright considers three weeks as long enough; but Mr. Boswell thinks it may continue on a month, or even six weeks in the first waterings, about November, and a something shorter time for those of the former sort of lands. Mr. Wright also recommends, in December and February, the land to be let dry, for the purpose of air for a few days, and that in February particular attention is necessary, not to permit the water to flow over the ground many days together, without being taken off, as there may be danger from white scum being formed; and by the land being left exposed to frost in its wet state, it may be injured that way. These inconveniences, it is supposed, however, by Mr. Wright, may be avoided by taking the water off in the day, and turning it upon the lands only during the night time. But Mr. Boswell, who has had extensive experience in this way, does not seem to apprehend any danger from this circumstance to the land.

Towards the beginning of the spring, as about March, and sometimes sooner, there is mostly a sufficient bite of grass to admit the lands to be fed by stock. The water should in this case be turned off for a fortnight or more, in order to give it a sufficient degree of firmness before the animals are turned upon it. During the following months, it is observed that the grass may be eaten close, but not later; as continuing it even for a few days in May would greatly injure the hay produce which is to be obtained, both in quantity and quality. In this month, when the grass has been fed down, the water should, according to Mr. Wright, be again turned over the lands for a few days, by which they are so moistened as to produce a full crop of hay. It is not improbable but that, with less close feeding, two crops of hay from such watered lands might frequently be taken with benefit. It is remarked by this writer, that the first crop of hay from watered lands, when cut sufficiently early, is equally good with that of most other sorts, but that when let stand too long, it becomes coarse and unfit for the purpose of fodder.

A late philosophical writer has suggested, that where the flooding of lands is continued some time, the water should only be suffered to trickle or flow over it gently from the higher parts, and not stagnate upon it; as, in the latter case, the grass roots are soon destroyed in the spring, and that when such materials begin to decay underneath the water, a white scum arises in consequence of the air set at liberty by the beginning putrefaction, which has been suspected as prejudicial to the grass, but which is rather the effect than the cause of the mischief, and demonstrates that the water has remained too long in a stagnant state upon the ground, and requires to be removed, or to have a fresh supply from the stream; but the former is probably the better practice. The necessity of continuing the irrigation,

or watering of land, after it has been once begun in hot climates and seasons, has been already shewn, and it is suggested that there may be injury done to the grafts plants by the sudden application of much water under such circumstances in some cases.

It is usefully inculcated by a late writer that, before any serious expence is incurred in works of this kind, the nature and effects of the water that is to be employed should be fully ascertained by the establishment of trial grounds, which, if it be proper and beneficial for the purpose, will be shewn by the superiority in the growth, verdure, and general appearance of the grafts towards the latter end of March, or the beginning of the following month. The quantity of water and extent of ground that can be covered by it must likewise be jointly taken into consideration before any improvement of this sort can with propriety be undertaken. And in every instance it is advised that due estimates, and a calculation of profit, be formed on the following principles. First calculating the probable advantages that may arise every year from hay and pasturage, and an annually increasing supply of manure and dung; then taking the interest at six per centum on the estimated cost of the works that may be requisite to produce them, together with the amount of the estimated annual expence of labour, and necessary repairs.

A great number of interesting instances of successful irrigation, or application of water over lands, in the midland districts, have been stated by the same author. And in this case, as in many others, Mr. Bakewell stands first as an improver of grafts-lands. It is stated that, formerly, a suit of meadows, lying by the banks of the Soar, received considerable benefit from the water of the river being spread over them judiciously in the time of floods. But now, not only these meadows, but near an hundred acres, he believes, of higher lands lying entirely out of the way of natural floods, are watered on the modern principle.

And it is remarked that the ingenious improver just noticed, like a man of experience in business, before he set about this great work, studied the art in the principal scene of practice, the west of England, where he spent some days with the ingenious Mr. Boswell, who, not many years ago, published a treatise on the subject. And that the great stroke of management in this department of his practice, which marks his genius in strong characters, is that of diverting to his purpose a rivulet or small brook, whose natural channel skirts the farthest boundary of his farm, falling, with a considerable descent, down a narrow valley, in which its utility, as a source of improvement to land, was confined. This rivulet, being turned at the highest place that could be commanded, and carried, in the canal manner, round the point of a swell, which lies between its natural bed and the farmery: by the execution of this admirable thought, not only commanding the skirts of the hill, as a scite of improvement by watering; but supplying, by this artificial brook, the house and farm-offices with water: filling, from it, a drinking-pool, for horses and cattle; a wash-pool, for sheep; and converting it into a multitude of other purposes: acquisitions which, Mr. Marshall says, many other situations in the island are capable of affording. One of these purposes is worthy of being mentioned as deserving the attention of the practical farmer. After endeavouring to invent a flat-bottomed boat or barge, to navigate upon this canal; for the purpose, most particularly, of conveying his turnips from the field to the cattle-sheds; and finding it not easily practicable, his great mind struck out, or rather caught, the beautifully simple idea of launching the turnips themselves into the water; and letting them flow down singly with the current.

"We throw them in," says he, "and bid them meet us at the barn's end!" in which situation he was then (October, 1789) contriving a reservoir, or dry dock, for them to fall into: with a grate at the bottom, to let out the water, and retain the turnips; which will there be laid up, clean washed, and freight-free, as a supply in frosty weather.

The improvements effected in this department of rural affairs, by this able improver, are, it is observed, not only extensive, but highly interesting, and are rendered the more striking, by "proof pieces," (a good term for experimental patches,) left in each scite of improvement.

In the art of irrigating or watering grafts-lands, on the modern principle, Mr. Paget, of Ibsstock, is also mentioned. This improver, it is stated, cuts a considerable quantity of hay, annually, from lands which have received no other manure than water, during the last forty years. A striking instance, it is supposed, that water is not merely a stimulus or force, as some men conceive it to be, but communicates some real nutriment to the herbage or grafts plants. In the practice of this improver, one circumstance occurred, which ought to be mentioned by way of caution. He found that in watering an orchard with the washings of the street and yards of a neighbouring village (a desirable species of water) the fruit-trees were greatly injured. A similar circumstance also took place in the practice of Mr. Bakewell. It is well known that surface water is in all circumstances highly injurious to fruit-trees of the apple kind. Also, near Appleby, in Yorkshire, Mr. Moor has executed a considerable work of this kind in a judicious manner, cutting a fresh channel on one side of the scite of improvement, for a rivulet which wound through its middle; in order to prevent its overflowing at an improper season; and converting the old channel, (partially filled up) into a main float; an expedient which may be frequently practised with good effect, in different situations. The same species of improvement has likewise been carried on with much spirit and success by Mr. Wilks of Mee-sham; and in other instances the practice has not been attended with less success, though under different circumstances.

According to the agricultural survey of the county of Devon, Mr. Templer, of Stover, has experienced from this method of husbandry very considerable beneficial effects on a tract of marshy land on the borders of his canal. It had formerly produced from five to ten shillings an acre. After having it drained and levelled, by forming conduits for the overplus water of the canal during the winter floods, and distributing it by well arranged sluices, so as to throw the enriching particles upon the surface, he converted these marshes into valuable, verdant meadow-land. The method that was adopted in constructing the distributing sluices was by having a number of trunks placed at various distances, to each of which a plug was fitted, and when the flood swelled the canal above the level requisite for navigation, the plugs were taken out, and the water immediately overflowed the surface of the meadow-lands, being at any time capable of being easily restrained by replacing the plugs: similar success is likewise asserted to have attended a like process on lands in the upper line of the canal.

Besides these, in Yorkshire, Cheshire, Wales, and the more northern parts of Scotland, as well as in the different districts in which the practice of irrigation has been long common, various improvements have been effected by the application of water to the surface of grafts-lands, which will be particularly noticed under the proper head, and also the most approved methods of accomplishing the business under different circumstances of soil and situation. See *Watering of Land*.

IRRITABILITY, in *Physiology*, denotes, in its most general,

neral sense, the capability of being irritated or excited, or that property by which living parts are enabled to execute their functions: when thus employed, it is synonymous with excitability, and may be regarded as denoting the most characteristic peculiarity of living matter. It is very commonly employed, in a more limited acceptation, to express the property by which muscles are enabled to contract, either in obedience to the will, or to any mechanical or chemical stimuli. In either case, this word is to be understood as signifying merely a property of living bodies, the real nature of which is as entirely unknown to us as that of attraction or chemical affinity. All the speculations which have been entertained on the subject of its nature, supposing it to be a peculiar fluid.

Electric matter like those (whose existence, be it observed, rests also on supposition) of electricity common or Voltaic, of magnetism or light, or considering it as identical with oxygen, may be dismissed without any formal refutation, as they are completely gratuitous assumptions. See LIFE, MUSCLE, and NERVE.

IRRITATION, in *Medicine*, signifies a state of feverishness and inquietude, in which the functions are impeded, and the strength gradually impaired, arising either from internal or external causes, but principally from the former. It is synonymous with the *erethism*, *ερεθισμός*, of the Greek writers. Irritation is produced, in different instances, by extraneous substances in the cavities or organs of the body, as calculi in the bladder, kidneys, or ureters; worms in the stomach or intestines, &c.; or by chronic disease in the viscera, such as scirrhus of the liver, of the mesenteric glands, &c.; or slow inflammation in any part; or by the prevalence of any depressing passion, as grief and anxiety; or by long watching; and various other causes. In febrile diseases, from whatever origin, a state of irritation is more readily produced; *i. e.* the same stimuli which excite little effect in the state of health, tend to aggravate the feverish symptoms, such as external heat, strong light, noises, muscular or mental exertion, and the like: whence, in every fever, whether idiopathic or symptomatic, the removal of every source of irritation is an indication constantly to be kept in view.

IRRSUMIT, in *Geography*, a town of East Greenland. N. lat. $61^{\circ} 10'$. W. long. $45^{\circ} 35'$.

IRSOA, a small island near the coast of Portugal, on the south side of the mouth of the Minho. N. lat. $41^{\circ} 50'$. W. long. $8^{\circ} 36'$.

IRTISCH, or IRTYSH, a river of Russia, which rises in the Chinese Soongoria, flows through the lake Norfnisan, in N. lat. $46^{\circ} 30'$, then enters the Russian territory, and after meandering through a large tract of country, throws itself, in N. lat. 61° , and E. long. $56'$, into the Oby. In its way it takes up several smaller rivers, and forms several islands, of which some occasionally disappear, and their places are supplied by others; and the intervals in which it is navigable are perpetually changing. Its water in the inferior regions is whitish and light, so that it should seem to flow over a bottom consisting chiefly of calcareous marl. It swarms with fish, and its sturgeons have a peculiar delicate flavour.

IRVINE, or IREWINE, a sea-port town and royal borough in the bailiwick of Cunningham, and county of Ayr, Scotland, is seated on the northern bank of the river Irvine, the estuary of which forms the harbour. On the southern side of the river is a row of houses uniformly built; and these, with others, are hamlets to the parish of Dundonald. The town appears to have been chartered at an early period; for in a grant from Alexander II., reference is made to previous charters. The magistracy of this town

had formerly extensive jurisdiction, but this has been abridged; but it still derives an ample revenue from a large tract of land near the town. Here is a commodious harbour, which has 10 or 12 feet of water on the bar at spring-tides. Several vessels, called busses, were formerly employed in the herring-fishery: at present the coal-trade is the chief object with the inhabitants. Above 24,000 tons have been shipped from this port in one year. Attached to the town is a dock-yard for ship-building, a large tan-yard, rope-ground, and a bleach-field. Many of the inhabitants are also engaged in the manufactory of carpets, muslins, silks, lawns, and other articles. In the year 1800, the town contained 729 houses, and 4584 inhabitants; though its population was estimated, in 1790, at 3500. The town is 61 miles W. by S. from Edinburgh. The church is described as a prominent object of beauty and interest in the town. Bowtree hill, in the vicinity of Irvine, is a seat of the honourable Mr. Hamilton; and near it is an old castle, belonging to the earl of Eglington, who has a seat in the neighbouring parish of Kilwinning. In the parish of Irvine it is said that a religious sect called Buchannites, from the name of the founder, had its origin. Sinclair's Statistical Account of Scotland, vol. vii. p. 169, &c. by the Rev. James Richmond.

ISA, in *Hindu Mythology*, one of the thousand names of Siva, the personification of the destructive or regenerative power of the deity. (See SIVA.) With the epithet *Maha*, or *great*, prefixed, Mahesa is formed, another of Siva's names. In this form, the name of his consort or fakti (see SAKTI) is Isi. Under these names sir William Jones recognizes the Osiris and Isis of Egypt. Ifwara seems but another mode of writing and pronouncing Isa; and the deduction of Osiris from that found is no strained etymology, especially when confirmed by many historical and characteristic coincidences. Isa and Isi are both personifications of the moon; for with the Hindus, that luminary is both male and female: and here we find Parvati (of whom Isi is only another form and name) again corresponding with the Diana of the Greeks, one of whose names is Luna.

ISAAC, in *Scripture Biography*, the son of Abraham and Sarah, was born at Gerar, in the country of the Philistines, B.C. 1896, when his father was 100, and his mother 90 years of age. His birth was previously announced to Abraham, as the son of covenant and promise, in whose seed all the nations of the earth should be blessed. His name, according to its Hebrew etymology, which denotes "he has laughed, or shall laugh," expresses the pleasure with which his parents received the prediction of his birth, and augured the honour that awaited his posterity. A circumstance, however, occurred, which tended to abate their joy; and this was a divine command to offer Isaac as a sacrifice. (See ABRAHAM.) At the age of 40 years, Isaac married Rebecca, the daughter of Nahor, Abraham's brother; and by her he had two twin-sons, Esau and Jacob. (See their articles.) This venerable patriarch, for whose history we refer to the book of Genesis, ch. xviii—xxxv. died at the age of 180 years, B.C. 1716, and was buried with his parents in the cave of Machpelah.

ISAAC I. COMNENUS, in *Biography*, emperor of the East, son of Manuel, was the first of the noble family of Comneni who arrived at the imperial throne. Isaac and his brother John were bequeathed by an affectionate father, conscious of his own defects in the service of his country, to the gratitude and favour of his sovereign. The noble youths were carefully trained in the learning of the times, the arts of the palace, and the exercises of the camp; and had become extremely popular with the people and the army. On the elevation

vation of Michael VI., the discontent of the soldiery was openly manifested. The generals, who considered themselves insulted by the election of Michael, secretly assembled in the sanctuary of St. Sophia, and would have chosen the venerable and valiant Catacalon, if the modesty of the veteran had not suggested the importance of birth as well as merit in the choice of a sovereign. Upon his refusal of the dignity, Isaac Comnenus was approved by general consent. Comnenus, then in Paphlagonia, soon learnt the decision of the military synod; and invested with the imperial ensigns, marched to Nice, which he took by surprise; but being encountered in the neighbourhood of that city by Michael's generals, he entirely defeated them, and proceeded to Constantinople. The dethroned emperor resigned his dignity, and retired to a monastery; and Isaac was solemnly crowned, September 1, 1057. His short reign was undisturbed by foreign enemies: he fell into a declining state of health, which he took as an admonition to retire from the world. John, whom he would gladly have invested with the imperial purple, refused to accept the toil, and it was conferred upon Constantine Ducas; and Isaac ended his reign of two years and three months in a monastery. Isaac in a great measure recovered his health, and survived two years his voluntary abdication. At the command of his abbot, he observed the rule of St. Basil, and executed the most servile offices of the convent; but he was gratified by the frequent and respectful visits of the reigning monarch, who revered in his person the character of a benefactor and saint. Gibbon. Univer. Hist.

ISAAC II. ANGELUS, emperor of the East, was raised to that dignity by the fall of Andronicus, the last of the Comnenian family who reigned at Constantinople. The revolution which hurled him from the throne, saved and exalted Isaac Angelus, who descended by the female line from the same imperial dynasty. "The successor of a second Nero," says the historian, "might have found it an easy task to deserve the esteem and affection of his subjects; nevertheless they sometimes had reason to regret the administration of Andronicus." Isaac abandoned himself to frivolous amusements and luxurious indulgences, and oppressed his people by the lavish expences of his household. "Isaac," says Mr. Gibbon, "slept on the throne, and was awakened only by the sound of pleasure: his vacant hours were amused by comedians and buffoons, and even to these the emperor was an object of contempt: his feasts and buildings exceeded the examples of royal luxury; the number of his eunuchs and domestics amounted to twenty thousand." His generals were successful in expelling the Sicilian invaders; but Isaac disgraced himself by the cruelty with which he treated the captives. Constantinople was besieged, and the weak emperor put all his trust in an image of the Virgin Mary, and the prayers of the monks. A revolt of the Bulgarians proved a lasting injury to the empire; and it became necessary to suffer them to establish an independent kingdom. Isaac drew upon himself various acts of hostility from Frederic Barbarossa, who was the friend and ally of the Crusaders. At length the perfidy of his own brother Alexius was more fatal to him than foreign violence. In 1195, he seized upon the throne, during the absence of Isaac on a hunting party; and obtaining possession of his person, deprived him of his sight, and shut him up in a lonesome prison. His son Alexius escaped, and engaged the western powers in his behalf; who, in 1203, took Constantinople, and replaced Isaac upon the throne in conjunction with his son. Another revolution, in 1204, effected by Alexius Ducas, deprived them of their seat; and the

death of Isaac very soon followed, or perhaps preceded, the murder of his son. Univer. Hist. Gibbon.

ISAAC, HENRY, a German composer of great renown in Italy, during the fifteenth century, under the name of Arrigo Tedesco; by which title he is celebrated by Politian. Quadrio, tom. ii. p. 321. says that he was maestro di cappella of the church of San Giovanni, in Florence; and the first who, in different ballad-airs, set the songs of Lorenzo il Magnifico, in three parts, for a processional masquerade. He flourished about 1475. Glareanus, in his "Dodecachordon," says that "Henry Isaac chiefly cultivated the church style; and in his works may be perceived a natural force and majesty, superior, in general, to any thing that can be found in the compositions of our times; though his style may be said to be somewhat rough. He was fond of long notes in some one of his middle parts, while the rest of the voices were in a manner playing round it, as the wind plays when it puts the waves in motion round a rock."

ISABAD, in *Geography*, a town of Persia, in the province of Irac; 50 miles S. of Hamadan.

ISABE, a town of Japan, in the island of Nippon; 50 miles N.W. of Jedo.

ISABEL, Str., one of the islands of Solomon, in the Pacific ocean, 200 miles in circumference, S. lat. 7° 30', about 160 leagues west of Lima, discovered by Mendana in 1567. The inhabitants are cannibals, and worship serpents, toads, and other animals. Their complexion is brown, their hair woolly, and they wear no covering but round their waist. They are divided into tribes, and are constantly at war with each other.

ISABELLA, in *Biography*, queen of Castile, born in 1451, was the daughter of John II. She passed the early part of her life in great obscurity, and without any prospect of a crown; but the Castilians having conspired against her brother Henry IV., obliged him to declare Isabella heiress to the kingdom. In 1469 she married Ferdinand king of Arragon; and upon the death of Henry in 1474, they were conjointly declared king and queen of Castile. They were proclaimed at Segovia, amidst loud acclamations; and the fidelity of their new subjects enabled them to defeat all the designs of their enemies, who had declared in behalf of Joanna, the supposed daughter of Henry. Alphonso IV. king of Portugal, espoused the person and the cause of the latter, and took up arms in her defence and his own. The defeat at the battle of Toro, in 1475, was fatal to his pretensions; and by a peace concluded in 1479, the right of Isabella and her husband was fully acknowledged, and Joanna retired into a monastery. In this same year, the crown of Arragon fell to Ferdinand; and from that period the kingdoms of Castile and Arragon were inseparably united, comprising the whole of Spain not possessed by the Moors. (See FERDINAND.) Religious zeal was a leading feature in her character; and the desire of propagating the Christian faith in parts of the world where it was yet unknown, was the chief motive of the encouragement she gave to the projects of Columbus, which eventually added so much to the Spanish monarchy. Her merits towards the church were rewarded by the title of "The Catholic," conferred by Innocent VIII. on both the royal partners, and their successors in the Spanish crown. Isabella died with the great regret of her subjects, in November 1504, in the 54th year of her age. Univer. Hist. Robertson's Hist. of America.

ISABELLA, in *Conchylology*, the name given by the French naturalists

naturalists to the beautiful pale-brown voluta, so much esteemed in the Dutch cabinets.

ISABELLA, in *Geography*, a small island near the coast of Brasil; 25 miles S.W. from the mouth of the river St. Francisco.—Also, a town on the north coast of the island Hispaniola, built by Christopher Columbus in the year 1493. N. lat. $19^{\circ} 55'$. W. long. $71^{\circ} 0'$. Isabella Point forms the N.E. side of the bay of the same name. Here Columbus formed the first Spanish settlement, naming it after his patroness queen Isabella. He was driven hither by a tempest in the night.

ISABELLA, *St.*, a town of Brasil, in the government of St. Salvador, near the coast. S. lat. $11^{\circ} 10'$.

ISACHNE, in *Botany*, from *ισος*, equal, and *αχνη*, a husk. Brown. Prodr. Nov. Holl. v. 1. 196. Class and order, *Triandria Digynia*. Nat. Ord. *Gramina*.

Ess. Ch. Calyx of two equal, membranous, obtuse valves, two-flowered. Florets equal, bivalve, of a paper-like texture; the outer male, inner female. Two scales beneath the germen. Stigmas feathery. Seed enclosed in the hardened calyx. *Brown*.

A genus of smooth grasses, growing in watery places. Leaves flat, their sheaths bearded at the top. Flowers panicled.—They have great affinity to *Panicum*, and the aspect of *P. coloratum*. It appears by Hermann's herbarium that his *Meneritana*, Fl. Zeyl. 24, is of this genus.

The only New Holland species given by Mr. Brown is

I. australis. "Panicle lanceolate, simple. Branches and flower-stalks zig-zag. Stem erect." Native of Port Jackson, New South Wales.

ISÆUS, in *Biography*, an orator of Chalcis, in Eubœa, who flourished about the end of the Peloponnesian war, the fourth century before the Christian era. When he came to Athens, he put himself under the instructions of the orator Lysias, from whom he obtained the same purity, accuracy, conciseness and perspicuity of style, which distinguished his master, with more force and vigour. He was celebrated for popular eloquence, and had the honour of being the instructor of Demosthenes. It has been said that he was dissipated in early life, but that as he attained to years of maturity, he became illustrious by the practice of the opposite virtues. He lived to the time of king Philip. He was author of sixty-four orations, of which ten only are now remaining, which are to be found among the *Oratores veteres Græci*. These have been translated by sir William Jones, and were given to the world in 1779. There was another Greek orator of this name, who came to Rome in the first century of the Christian era, and who is mentioned with great applause by Pliny the younger, who observes that he always spoke extempore, and wrote with elegance, unlaboured ease, and great correctness.

ISAGO, in *Geography*, a country of Africa, N.W. of Benin.

ISAGON, in *Geometry*, is sometimes used for a figure consisting of equal angles.

ISAIAH, or the *Prophecy of Isaiah*, a canonical book of the Old Testament. Isaiah is the first of the four greater prophets; the other three being Jeremiah, Ezekiel, and Daniel. This prophet was of royal blood, his father Amos being brother, as some have said, to Azariah, or Uzziah, king of Judah.

The first appointment of Isaiah to the exercise of the prophetic office is supposed to have taken place in the last year of Uzziah's reign, or 758 B.C., at which time he is supposed to have been about 35 years of age; and if he lived to the reign of Manasseh B.C. 696, by whose order,

according to a tradition of the Jews, he was fawn afunder, the duration of his office must have extended to 61 or 62 years. But this Jewish tradition is uncertain; and one of their principal rabbins (Aben Ezra, Com. in Is. i. 1.) seems rather to think that he died before Hezekiah, which opinion is received as the most probable. It is certain, however, that he lived at least to the 15th or 16th year of Hezekiah; and this makes the least possible term of the duration of his prophetic office, about 47 or 48 years; so that he prophesied in the reigns of Uzziah, Jotham, Ahaz, and Hezekiah. The time of the delivery of some of the prophecies is either expressly marked in, or easily deducible from, the history to which they relate; that of a few others may, with some probability, be inferred from expressions, descriptions, and circumstances interwoven in the predictions themselves. The prophecy contained in the first chapter stands single and unconnected; and contains a severe remonstrance against the corruptions prevailing among the Jews of that time; powerful exhortations to repentance; grievous threatenings to the impatient; and gracious promises of better times, when the nation shall have been reformed by the just judgments of God. The expression is upon the whole clear; the connection of the several parts easy; and in regard to the images, sentiments, and style, it gives a beautiful example of the prophet's elegant manner of writing; though perhaps it may not be equal in these respects to many of the following prophecies. The prophecy contained in the second, third, and fourth chapters, makes one continued discourse. The first five verses of the second chapter foretell the kingdom of the Messiah, the conversion of the Gentiles, and their admission into it. From the 6th verse to the end of the 2d chapter, is foretold the punishment of the unbelieving Jews for their idolatrous practices, their self-confidence and distrust of God's protection; and moreover the destruction of idolatry, in consequence of the establishment of Messiah's kingdom. The whole third chapter, with the first verse of the fourth, is a prophecy of the calamities of the Babylonian invasion and captivity; with a particular amplification of the distress of the proud and luxurious daughter of Sion. Chapter iv. 2—6, promises to the remnant, which shall have escaped this severe purgation, a future restoration to the favour and protection of God. The prophecy was probably delivered in the time of Jotham, or perhaps in that of Uzziah. The 5th chapter is unconnected with that which precedes, and with that which follows it; and the subject of it, like that of the first chapter, is a general reproof of the Jews for their wickedness; but it exceeds that chapter in force, in severity, in variety, and in elegance; and it adds a more express declaration of vengeance, by the Babylonian invasion. The vision in the 6th chapter seems to contain a solemn designation of Isaiah to the prophetic office, and it is therefore thought by most interpreters to be the first in order of his prophecies. Bishop Lowth, however, conjectures that this may not be the case; because Isaiah is said to have prophesied in the time of Uzziah; but as Isaiah's prophecies are not placed in exact order of time, the 2d, 3d, 4th, and 5th chapters seem to be antecedent to the 1st chapter, and to suit the time of Uzziah, or the former part of Jotham's reign, whereas the 1st chapter can hardly be earlier than the last years of Jotham. Accordingly this might be a new designation, to introduce more solemnly a general declaration of the whole course of God's dispensations in regard to his people, and the fates of the nation; which are even now still depending, and will not be fully accomplished till the final restoration of Israel. The 7th chapter begins with an historical account of the occasion of this prophecy; and then

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then follows a prediction of the ill success of the designs of the Israelites and Syrians against Judah; and a denunciation of the calamities to be brought upon the king and people of Judah by the Assyrians, whom they had now hired to assist them. The 8th chapter is closely connected with the foregoing, and contains a confirmation of the prophecy before given of the approaching destruction of the kingdoms of Israel and Syria by the Assyrians, of the denunciation of the invasion of Judah by the same Assyrians; together with a repeated general assurance, that all the designs of the enemies of God's people shall be in the end disappointed and brought to nought, concluding, after admonitions and threatenings, with an illustrious prophecy of the manifestation of the Messiah, the transcendent dignity of his character, and the universality and eternal duration of his kingdom. This prophecy concludes at the 6th verse of the 9th chapter. The whole passage from chapter ix. 7. to chapter x. 4. contains a distinct prophecy, and a just poem; remarkable for the regularity of its disposition and the elegance of its plan; it is addressed exclusively to the kingdom of Israel, and the subject of it is a denunciation of vengeance awaiting their enemies. The 5th verse of the 10th chapter begins with a new and distinct prophecy, which is continued to the end of the 12th chapter. It appears that it was delivered after the taking of Samaria by Shalmaneser, in the 6th year of the reign of Hezekiah, and as the former part of it foretells the invasion of Sennacherib, and the destruction of his army, which makes the whole subject of this chapter, it must have been delivered before the 14th year of the same reign. Then, according to Isaiah's usual method, he takes occasion, from the mention of a great temporal deliverance by the destruction of the Assyrian army, to launch out into the display of the spiritual deliverance of God's people by the Messiah, to whom this prophecy relates. (See Rom. xv. 12.) The hymn in the 12th chapter seems, by its whole tenor, as well as by many expressions in it, much better calculated for the use of the Christian church, than for the Jewish in any circumstances, or at any time, that can be assigned; and the Jews themselves seem to have applied it to the times of the Messiah. The 13th and 14th chapters (excluding the five last verses of the latter, which belong to a quite different subject) contain one entire prophecy, foretelling the destruction of Babylon by the Medes and Persians; delivered probably in the reign of Ahaz (see Vitringa, i. 380.) about 200 years before the completion of it. The former part of this prophecy, says bishop Lowth, is one of the most beautiful examples, that can be given, of elegance of composition, variety of imagery, and sublimity of sentiment and diction in the prophetic style; and the latter part consists of an ode of supreme and singular excellence. The 15th and 16th chapters, which ought not to have been separated, taken together, make one entire prophecy, delivered, most probably, soon after the foregoing, in the 1st year of Hezekiah, and accomplished in his 4th year, when Shalmaneser invaded the kingdom of Israel. The prophecy in the 17th chapter comprehends the kingdom of Samaria and the Israelites, confederated with Damascus and the Syrians against the kingdom of Judah. It was delivered probably soon after the prophecies of the 7th and 8th chapters, in the beginning of the reign of Ahaz, and was fulfilled by Tiglath-Pileser's taking Damascus, (2 Kings, xvi. 9.) overrunning a great part of the kingdom of Israel, and carrying a great number of the Israelites also captives to Assyria; and still more fully in regard to Israel, by the conquest of the kingdom, and the captivity of the people, effected a few years after by Shalmaneser. The prophecy in the 18th chapter is in all its circumstances obscure and

doubtful. In the 19th chapter the prophet seems to have had in view the conquest of the Persians by Alexander, which was in fact a deliverance to Egypt, together with other preceding and collateral incidents, and the favour granted to the Jews by Alexander and the Ptolemies. The 20th chapter refers to the taking of Ashdod or Azotus, and warns the Jews against depending too much on the assistance of Egypt. The ten first verses of the 21st chapter contain a prediction of the capture of Babylon by the Medes and Persians; the remaining prediction is obscure. The prophecy, ending with the 14th verse of the 22d chapter, foretells the invasion of Jerusalem by the Assyrians under Sennacherib, or by the Chaldeans under Nebuchadnezzar. Vitringa thinks that the prophet had both in view; that of the Chaldeans in the first part, verse 1—5, and that of the Assyrians in the latter part, v. 8—11. The prophecy in the 23d chapter denounceth the destruction of Tyre by Nebuchadnezzar. From the 13th chapter to the 23d inclusive, the fate of several cities and nations is denounced; of Babylon, of the Philistines, Moab, Damascus, Egypt, Tyre. The prophet then proceeds, in the 24th and three following chapters, to declare the judgments impending upon the people of God themselves, for their wickedness and apostasy; and the desolation that shall be brought on their whole country. The particular subject of the 24th chapter has been differently assigned by interpreters; some refer it to the desolation occasioned by the invasion of Shalmaneser; others to the invasion of Nebuchadnezzar; and others to the destruction of the city and nation by the Romans. Vitringa is singular in referring it to the persecution of Antiochus Epiphanes. Bishop Lowth thinks it may have a view to all the three great desolations of the country by Shalmaneser, by Nebuchadnezzar, and by the Romans, especially the last. The 25th chapter contains a song of praise, dictated more by the prospect of future mercies, than by the recollection of past events. The subject of the 27th chapter seems to be the nature, the measure, and the design of God's dealings with his people. The prophecy in the 28th chapter, as far as the fifth verse, relates to the Israelites, and manifestly denounces their destruction by Shalmaneser. It then turns to the two tribes of Judah and Benjamin, the remnant of God's people, who were to continue a kingdom after the final captivity of the Israelites. It begins with a favourable prognostication of their affairs under Hezekiah; but soon changes to reproofs and threatenings, for their intemperance, disobedience, and profaneness. The subject of the 29th and four following chapters is the invasion of Sennacherib; the great distress of the Jews while it continued; their unexpected and sudden deliverance by God's interposition in their favour; the subsequent prosperous state of the kingdom under Hezekiah; interspersed with reproofs and threatenings, and also with promises of better times. The 34th and 35th chapters make one distinct prophecy; an entire, regular, and beautiful poem, consisting of two parts; the first containing a denunciation of divine vengeance against the enemies of the people, or church of God: the second describing the flourishing state of the church of God, consequent upon the execution of those judgments. The 36th chapter contains a history of the invasion of Sennacherib, and of the miraculous destruction of his army, as a proper introduction to the prophecy in the 37th chapter, which is the answer of God to Hezekiah's prayer, which could not be well understood without it. The narration of the 38th and 39th chapters seems to be in some parts an abridgment of that of 2 Kings, xx. The course of prophecies which follow from the 40th chapter to the end of the book, and which, taken together, constitute the most elegant part of the writings of the Old Testament,

lament, interspersed also with many passages of the highest sublimity, was probably delivered in the latter part of the reign of Hezekiah. They are chiefly of the consolatory kind; and therefore they are opened with the promise of the restoration of the kingdom, and the return of the people from their captivity, by the merciful interposition of God in their favour. The prophet, however, extends their views to the fulfilment of God's promises of establishing a more glorious and an everlasting kingdom, under the Messiah to be born of the tribe of Judah, and of the family of David. He connects these two events together, and hardly ever treats of the former without throwing in some intimations of the latter.

Isaiah has been, with peculiar propriety, denominated the "evangelical prophet," on account of the number and variety of his predictions concerning the advent and character, the ministry and preaching, the sufferings and death, and extensive permanent kingdom of the Messiah. His predictions are, indeed, so explicit and determinate, as well as so numerous, that no one can be at a loss in applying them to the mission and character of Christ, and the events that are cited in his history by the New Testament writers. The whole book of Isaiah, some few passages excepted, which, if brought together, would not at most exceed the bulk of five or six chapters, is considered by bishop Lowth as poetical. (See the article *PROPHETIC POETRY*.) "He abounds," says this learned critic, "in such transcendent excellencies, that he may be properly said to afford the most perfect model of the prophetic poetry. He is at once elegant and sublime, forcible and ornamented; he unites energy with copiousness, and dignity with variety. In his sentiments there is uncommon elevation and majesty; in his imagery the utmost propriety, elegance, dignity, and diversity; in his language uncommon beauty and energy; and, notwithstanding the obscurity of his subjects, a surprising degree of clearness and simplicity. To these we may add, there is such sweetness in the poetical composition of his sentences, whether it proceed from art or genius, that if the Hebrew poetry at present is possessed of any remains of its native grace and harmony, we shall chiefly find them in the writings of Isaiah: so that the saying of Ezekiel (xxviii. 12.) may most justly be applied to this prophet:

"Thou art the confirmed exemplar of measures,
Full of wisdom, and perfect in beauty."

Isaiah greatly excels, too, in all the graces of method, order, connection, and arrangement; though in asserting this we must not forget the nature of the prophetic impulse, which bears away the mind with irresistible violence, and frequently in rapid transitions from near to remote objects, from human to divine: we must also be careful in remarking the limits of particular predictions, since, as they are now extant, they are often improperly connected, without any marks of discrimination, which injudicious arrangement, on some occasions, creates almost insuperable difficulties." Bishop Lowth has selected as a specimen of the kind of poetry in the language of which Isaiah delivers his prophecies, the prediction contained in the thirty-fourth and thirty-fifth chapters; and pointed out the beauties that eminently distinguish the simple, regular, and perfect poem, as he denominates this prophecy. The latter part of the book, commencing at the fortieth chapter, is, perhaps, says the same excellent judge, "the most elegant specimen remaining of inspired composition, and yet, in this respect, is attended with considerable difficulty. It is, in fact, a body or collection of different prophecies, nearly allied to each other as to the subject, which, for that reason, having a sort of connection, are not to be separated but with the utmost difficulty. The general

subject is the restoration of the church. Its deliverance from captivity; the destruction of idolatry; the vindication of the divine power and truth; the consolation of the Israelites, the divine invitation which is extended to them, their incredulity, impiety, and rejection; the calling in of the gentiles; the restoration of the chosen people; the glory and felicity of the church in its perfect state; and the ultimate destruction of the wicked, are all set forth with a sufficient respect to order and method. If we read these passages with attention, and duly regard the nature and genius of the mythical allegory; at the same time remembering, that all these points have been frequently touched upon in other prophecies promulged at different times, we shall neither find any irregularity in the arrangement of the whole, nor any want of order and connection as to matter or sentiment in the different parts. Grotius calls Isaiah the Demosthenes of the Hebrews, and bishop Lowth ranks him with Homer. (See *JEREMIAH*.) As a commentator on this book, the learned are under great obligations to Vitrina in his excellent commentary in 2 vols. fol. Amongst the English translations, the first place will be allowed to bishop Lowth for his admirable work, abounding so much with learned criticism and correct taste, entitled "Isaiah; a new Translation, with a Preliminary Dissertation, and Notes, critical, philological, and explanatory," first published in 1778, 4to. in which the author has pursued the metrical arrangement. The late Michael Dodson, esq. also published in prose "A New Translation of Isaiah; with Notes supplementary to those of Dr. Lowth, late Bishop of London, and containing Remarks in many parts of his Translation and Notes, by a Layman," 1790, 8vo. We have lately had a valuable translation of the prophecies of Isaiah by Dr. Stock, bishop of Killala. See the works already cited, and Lowth's *Prælectiones de Sac. Poet. Heb.* N° xx—xxi.

ISAKLU, in *Geography*, a town of Asiatic Turkey, in Caramania; 12 miles N.W. of Akshehr.

ISAKOVA, a town of European Turkey, in Moldavia; 60 miles N.E. of Jassy.

ISAKZI, a town of European Turkey, on the Danube; 26 miles W. of Ismail. N. lat. 45° 18'. E. long. 29° 9'.

ISAMBLUCIS, in *Natural History*, the name of a genus of fossils of the class of the *selenitæ*, but of the columnar, not the rhomboidal kind.

The *selenitæ* of this genus consist of six sides, and two obtuse or abrupt ends; and all their sides being very nearly of the same breadth, they much resemble broken pieces of the columns of sprig-crystal.

The bodies of this genus, as well as the rest of the columnar *selenitæ*, are subject to a longitudinal crack, which sometimes admitting a small quantity of clay, shapes it into the figure of an ear of grass. Hill's *Hist. of Foss.* p. 121. See the article *SELENITES*.

ISANDORA, in *Geography*, a town of Angola, on the Coenza; 25 miles S. of Loanda.

ISANI, in *Mythology*, one of the many names of the Hindoo deity, Siva; also of his fakti, or consort Parvati: it seems nearly similar with Isa. (See under those articles.) The Hindoos reckon eight of their principal deities, as regents or supporters of the eight cardinal and intermediate points of the heavens. Of these regents, called Maruts, or winds, Indra is the chief, and rules the East. (See *INDRA* and *MARUT*.) Isani or Siva, in that form, is by some mythologists, but not by all, reckoned another, and ruler of the north-east. See Moor's *Hindoo Pantheon*, under *Indra* in the index.

ISANTHUS, in *Botany*, so called by Michaux, from *ισος*, equal, and *ανθος*, a flower, because this plant, unlike most

most others of the class *Didynamia*, has a regular corolla.—Michaux Amer. v. 2. 3. t. 30. Class and order, *Didynamia Gymnospermia*. Nat. Ord. *Verticillate*, Linn. *Labiata*, Juss.

Gen. Ch. *Cal.* Perianth bell-shaped, rather spreading, cloven half way down into five, nearly equal, lanceolate segments; the two lower ones, especially after the corolla has fallen off, more close than the rest. *Cor.* nearly equal with the calyx, almost regular; tube straightish, narrowly cylindrical, limb somewhat wheel-shaped, five-cleft; each segment oval and similar, with two spots at the base. *Stam.* Filaments four, nearly equal, a little shorter than the corolla, perfectly erect; anthers oblique, cloven below; cells ovate, diverging nearly at a right angle. *Pist.* Germen superior, four-cleft; style the length of the stamens, recurved at top; stigmas two, recurved and much spreading, linear tongue-shaped; the lower one rather the longest. *Peric.* none, except the permanent, spreading tube of the calyx. *Seeds* four, obovate, rugged and reticulated, connected only at their base, filling the calyx.

Eff. Ch. Calyx five-cleft. Corolla nearly equal, five-cleft. Stamens erect. Anthers with divaricated lobes.

1. *I. ceruleus*. Blue Isanthus.—Michaux Amer. v. 2. t. 30. A native of Virginia and Carolina, in a chalky soil. The whole plant is rather viscid and hairy. *Root* annual. *Stem* about a foot high, erect, round, branched. *Leaves* opposite, on short stalks, ovate, acuminate, ribbed or nerved, fringed. *Flowers* of a pale blue.

We are only acquainted with this plant from the description and figure of Michaux. It is without doubt very nearly allied to the *Asperifolia*, though we have followed that author in referring it to the class *Didynamia*.

ISARIA, in *Geography*, a town of Naples, in Calabria Ultra; eight miles E. of Nicaastro.

ISARRIA, a town of Naples, in Calabria Ultra; 11 miles S. of Squillace.

ISATIS, in *Botany*, is the *Isatis* of Dioscorides, and *Isatis* of Pliny, but its derivation is totally unknown. *Wood*. Linn. Gen. 344. Schreb. 435. Willd. Sp. Pl. v. 3. 420. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 693. Ait. Hort. Kew. v. 2. 406. Tournef. t. 100. Juss. 242. Lamarck Illustr. t. 554. Gært. t. 142. Class and order, *Tetradynamia Siliculosa*. Nat. Ord. *Siliquosa*, Linn. *Crucifera*, Juss.

Gen. Ch. *Cal.* Perianth of four, ovate, spreading, coloured, deciduous leaves. *Cor.* of four petals, cross-shaped; petals oblong, obtuse, spreading, by degrees attenuated into claws. *Stam.* Filaments six, slightly spreading, the length of the corolla; two of them shorter; anthers oblong, lateral. *Pist.* Germen superior, oblong, two-edged, compressed, as long as the shorter stamens; style none; stigma obtuse, capitate. *Peric.* Pouch oblong, lanceolate, obtuse, compressed, two-edged, of one cell, not gaping, two-valved, deciduous; the valves are boat-like, compressed and carinated. *Seed* solitary, ovate, central.

Eff. Ch. Pouch lanceolate, one-celled, single-seeded, deciduous, with two boat-like valves.

1. *I. tinctoria*. *Wood*.—Linn. Sp. Pl. 936. Engl. Bot. t. 97. Mart. Fl. Rust. t. 41.—“Radical leaves crenated, stem-leaves arrow-shaped. Pouch oblong, smooth.”—Rather a scarce plant in Britain, flowering in July, and found in fields. It was not originally a native of this island, but has become naturalized from its frequent culture for the purpose of dyeing blue. It is also a basis for several other colours. Pliny says the ancient Britons stained their bodies with woad, but from the circumstance of this plant having been introduced into this country from the shores of the Baltic, Spain, Italy, &c. Mr. Miller concludes that

Woad (*Refeda Luteola*), and not Woad, was used by our ancestors for the purpose above related. But if the plant in question can be identified with Pliny's it is undoubtedly a native. *Root* biennial. *Stem* erect, branched, furnished with alternate, somewhat succulent leaves; the radical ones stand on long foot-stalks, and are crenated. *Calyx* as well as the *corolla* of a yellow colour. *Seed-vessels* dark brown. *Stem* and *leaves* occasionally besprinkled with a few hairs.

Linnaeus enumerates three other species of *Isatis*, *hystanica*, *armena*, and *egyptiaca*, the last of which is very properly removed by Willdenow to *Cakile* of Gærtner. Villars and Allioni mention another species under the name of *alpina*. This genus was very unaccountably placed by Linnaeus in his order of *Siliquosa*, together with *Bunias* and *Crambe*; but its near affinity to *Draba*, *Lepidium*, &c. in the shape and size of its pouch, sufficiently warrant professor Schreber's placing it among the *Siliculosa*.

ISATIS, in *Zoology*. See LAGORUS.

ISATODES, a word used by Hippocrates, and some other of the old writers, to express a greenish colour of the bile discovered in the stools, which resemble the colour of the herb *isatis*, or woad. This was esteemed an indication of a highly depraved bile.

ISAURIA, in *Ancient Geography*, a town of Asia Minor, near Pisidia. Its inhabitants were merely occupied in plunder, when Servilius made war upon them and conquered them. Hence he obtained the name of the “Isaurian.” Its chief town was “Isaura,” or “Isauropolis,” which were repeatedly destroyed and rebuilt. Under the Greek emperors, Isauria became a considerable province at the expense of the neighbouring provinces. Hierocles, in his “Notitia,” reckons in it 23 episcopal towns, and Leon-le-Sage enumerates 29.

ISBARTEH, in *Geography*, a town of Asiatic Turkey, in Natolia, the residence of a Pacha; and in the faubourgs are four Greek churches; 92 miles S. of Kiutaja. N. lat. 37° 44'. E. long. 30° 56'.

ISBASTER, one of the smaller Shetland islands. N. lat. 60° 34'. W. long. 0° 58'.

ISCA, or ISCA *Danmoniorum*, in *Ancient Geography*, a town of Albion or England, the capital of the Danmonii, and most probably Exeter.

ISCA *Silurum*, the capital of the Silures, now Caerleon in Monmouthshire. Here the second legion of the Romans, which had contributed greatly to the reduction of the Silures, was placed in garrison (as some antiquaries have imagined) by Julius Frontinus, to keep that people in obedience. It is certain, however, that this legion was very early and very long stationed at this place. Ica *Silurum* was, in the time of the Romans, a city not only of great strength, but also of great beauty and magnificence. This appears from the description which is given of its ruins by Giraldus Cambrensis, in his topography of Wales, written in the 12th century, soon after it had been destroyed and abandoned.

ISCALES, a town of Britain, in the country of the Belgæ, generally placed at Ilchester in Somersetshire.

ISCARIOTH, a place of Judea, in the tribe of Ephraim, whence Judas, who betrayed our Saviour, is supposed to have derived his surname.

ISCHÆMUM, in *Botany*, from *ισχως*, to repress, and *hæma*, blood, because it was supposed to possess the virtue of stopping hemorrhages from recent wounds. In this sense the name was originally applied to the *Panicum sanguinale* of Linnaeus, called, for the same reason, *Sanguinaria* by some writers; and is now retained for a genus of grasses bearing some resemblance to that, but the reputed virtue above-mentioned can scarcely be thought to have any foundation.

tion. Linn. Gen. 542. Schreb. 718. Mart. Mill. Dict. v. 2. Brown. Prod. Nov. Holl. v. 1. 204. Just. 35. Lamarck. Illustr. t. 839. Class and order, *Polygamia Monoecia*, or *Triandria Digynia*. Nat. Ord. *Gramina*.

Gen. Ch. Cal. Glume two-flowered, of two cartilaginous nearly equal valves, situated transversely; the outer almost ovate, tumid, cloven and acute at the top, the upper part of the back flattened, striated, bordered; inner oblong, boat-like, pointed or awned at the top, furnished with a longitudinal dorsal membrane below the extremity. *Florets* shorter than the calyx, the outer one male, inner hermaphrodite. *Cor.* (in the hermaphrodite floret) of two thin, membranous, pellucid glumes; the outer swelling, either beardless or awned, cloven to the insertion of the awn, acute; awn long, slender, bent, twisted in the lower part; inner glume lanceolate, acute, its margins folded together; (in the male floret) of two rather firmer, pellucid, somewhat coloured glumes; the outer oblong, swelling, contracted upwards, acute, beardless; inner oblong, obtuse, concave at the back, thinner and acute at the margin: *Nectary* in each of two small, spatulate, abrupt, notched leaves. *Stam.* Filaments three, capillary, short; anthers oblong, cloven at each end. *Pistl.* (in the hermaphrodite floret) Germen oblong; styles two, capillary, erect, shorter than the corolla; stigmas oblong, feathery, spreading, prominent. *Peric.* none, except the unchanged calyx and corolla. *Seed* (in the hermaphrodite floret) solitary, oblong, linear, convex at one side.

Ess. Ch. Calyx of two valves, two-flowered, placed in pairs, laterally, on a jointed stalk; outer valve flattened. Corolla of two valves, shorter than the calyx. Stigmas feathery. One floret male, or neuter.

Linnaeus defines two species only, *I. muticum*, Sp. Pl. 1487, and *I. arifolium*, *ibid.* The first is destitute of awns, and is the *Tigadi* of Rheede Hort. Mal. v. 12. 91. t. 49, found in every kind of soil in Malabar, but not of any particular use, except as a grass in general. The root is pcrenia. *Stems* about a foot high, round, smooth, reed-like, leafy. *Leaves* lanceolate, pointed, broad at the base. *Spikes* terminal, double, short, close, shining. *I. arifolium*, distinguished by its awns, was gathered by Osbeck in China, and has narrower leaves.

I. rugosum, Salisb. Ic. 1. t. 1. Hort. 27.—“External barren glumes transversely rugose; one of the fertile ones, whether male or female, awned.”—Found by Koenig in the borders of rice fields in the East Indies. This is very remarkable for the strong wrinkles or furrows of its glumes. Linnaeus was inclined to make it a new genus by the name of *Cicadaria*. Mr. Salisbury cultivated it in his stove at Chapel Allerton before 1796.

Mr. Brown in his *Prodromus* has added six new species to *Ischemum*, and also justly refers to this genus the *Colladoa* of Cavanilles, Ic. v. 5. 37. t. 460.

ISCHEZIA, Ἰσχηζία, in *Antiquity*, anniversary sports celebrated at Olympia, in memory of Ischenus, the grandson of Mercury and Hierea; who, in a time of famine, devoted himself to be a sacrifice for his country, and was honoured with a monument near the Olympian stadium.

ISCHIA, in *Geography*, a volcanic island, situated at the eastern entrance of the gulf of Naples, about 18 miles in circuit; the see of a bishop, suffragan of that of Naples, and containing three parishes, and a convent of nuns. The volcanic substances of which this island is internally composed, prove, beyond the possibility of doubt, says Spallanzani, that it owes its origin to fire. The castle of the city of Ischia, as it is called, is built on a rock surrounded by the sea, and a little more than a quarter of a mile in circuit. The two component substances of this rock are lava and

tufa. About a mile to the west is a torrent of lava, called the “Arfo” or burnt ground, which is the most recent of any in the island, since it flowed in 1302. This lava, though it flowed five centuries ago, is absolutely sterile; producing not a single blade of grass, and only affording, in some places, a few arid and useless plants of the lichen, or liverwort. On the surface, and for a little depth, it is light and spongy, and easily crumbles; but deeper, it becomes dense and harder. This lava is of the hornstone base, and has an earthy ground; varying in colour from that of iron to a reddish-black, and having incorporated in it very numerous felspars. M. Dolomieu says, that the eruption of the Arfo, though it continued two years, never produced any pumice, but only black scorix; but Spallanzani observes, that the hornstone, by a violent fire, may be changed into a true pumice. Though this transmutation rarely happens, no part of the island, however, abounds so much with pumices as the Rotaro, a mountain situated between Casamicciola and the city of Ischia. This mountain is of a conical shape, and composed of tufa, pumices, and enamels. The extent of the pumices is more than a mile. The Rotaro is the only place in Ischia which affords enamels. The mountain of St. Nicola, which in earlier times was called Epopco, and which is in the centre of the island, was, as Spallanzani says, without doubt, the first that towered above the waves. The constituent substances of this mountain are of various kinds. The sulphate of alumine (alum) was formerly extracted in Ischia for commercial purposes; and the manufacture was principally carried on at Catrico, a place situated above Lacco, on the higher eminences of the Epopco. But a careful observer has not been able recently to discover any remaining vestige of this substance. Spallanzani concludes from experiments on different lavas, that this valuable substance might still be obtained at Ischia. This ingenious naturalist coasted the island and examined various mountains that occupy the lower part of it. He began with the Vieo, which is partly formed of tufa, and partly of two currents of lava, which descend into the sea. The base of both these lavas is hornstone, and they abound in felspars. He then proceeded to Monte Zaro, formed, towards the sea, by a river of lava, extending a mile in length, and nearly two in breadth. The base of this lava is hornstone, and it contains mica and felspars. From the termination of Monte Zaro to the commencement of Monte Imperatore, is a long and ample tract, almost entirely tufaceous, scattered over with fragments of pumice. The Monte Imperatore presents different sorts of lava, the base of which is hornstone, intermixed with abundance of felspars. In many parts of the island our author found a ferruginous sand, which not only moves the magnetic needle, but is strongly attracted by the loadstone. This island, our author apprehends, when it was first produced by conflagrations in ancient, and to us unknown, times, must have been of much greater extent than it is at present. Time has also produced a great alteration in the interior parts of the island. From the summit of Epopeo, a number of conical eminences may be seen; but their internal craters no longer exist; nor can be found in Ischia incontestible traces of a single one, since those depths and ample cavities, those resemblances of theatres and amphitheatres, which may be every where observed, may be equally the effect of fire or water. The substances, our author conceives, which have furnished aliment to the different conflagrations of Ischia, have had their centre in those argillaceous rocks, which, by the above-mentioned eruption in 1302, shewed that they were not then exhausted. See Spallanzani's *Travels in the Two Sicilies*, &c. vol. i.

Along the coast of this island a few pretty villages are dispersed;

dispersed; and detached habitations are scattered over the surface of the whole island, and are to be found even at an elevation where the culture of the soil must cease. The white colour of the houses forms an agreeable contrast with the verdure of the vines and gardens in which they are embosomed. At the summit of the mountain, which forms this island, a hermitage, composed of a chapel, and three cells, has been excavated out of the volcanic rock. The cells are inhabited by as many hermits. One of them goes his round through the island twice a week, and brings back bread, oil, eggs, and every thing necessary for the service of the altar. The inhabitants give him alms with joy, and recommend themselves to his prayers. They make a pilgrimage annually to this chapel.

This island enjoys a propitious climate, and the sky is seldom obscured with clouds. The winters are mild, the reptiles harmless, and the springs cure various diseases. The government is likewise mild, and the island is exempt from taxes. The king pays it a visit every year, and gives portions to the indigent young females.

An hospital is established here at the expence of a charitable society at Naples. Some hundreds of sick receive attendance and relief during the bathing-season. Several barks are solely employed in removing the convalescents to Naples, and bringing back other patients to the hospital. The lame, who are cured of their infirmities, leave behind them their crutches, which they consecrate to the Madonna, or to some particular patron. The trees, shrubs, and plants which prefer volcanic soils, thrive surprisingly in this island. Here and there are seen groves of oak and chestnut trees; which are suffered to grow only 10 years. The orange, pomegranate, fig, Neapolitan medlar, and arbutus, are the most common trees in the gardens. Of wild shrubs, the myrtle and the mastic are the most numerous. The inhabitants have something peculiar in their language, their figure, and their dress. In their conversation, they scarcely ever use the word *man*, that of *Christian* being substituted for it; and with them *Christian* is synonymous with *Catholic*. In their pious expressions they seldom soar higher than the Mother of God. It is to our Lady they recommend you, when they leave you, and they wish you a *holy night* (*santissima notte*). To her they apply when afflicted with disease. At the death of an adult they pray for the repose of his soul. The death of a child is regarded as a happy event. Religious festivals are with them days of rejoicing. N. lat. 40° 50'. E. long. 13° 46'.

The soil feeds no animals besides asses and goats. The roofs of the houses throughout the island are flat, and are used for drying fruits and other purposes.

ISCHIADICUS MORBUS, in *Surgery*. See *Disease of Hip-joint*.

ISCHIAS. See *Disease of Hip-joint* and **SCIATICA**.

ISCHIATIC, in *Anatomy*, an epithet applied to certain parts of the body situated near the ischium; as the ischiatic artery and nerve. See **ARTERY** and **NERVE**.

ISCHIATOCELE, in *Surgery*, a hernia taking place at the sacro-ischiatric foramen. See **HERNIA**.

ISCHIM, in *Geography*, a town of Russia, in the government of Tobolsk, on the river Ischim, which runs into the Irtysh, N. lat. 57° 45'. E. long. 95°; 108 miles S. of Tobolsk. N. lat. 56° 10'. E. long. 69° 14'.

ISCHIMSKOI, a town of Russia, in the government of Tobolsk, at the conflux of the Ischim and Obi; 112 miles E. of Tobolsk.

ISCHIO-CAVERNOSUS, in *Anatomy*, a name given by Winslow and others to the cretor penis muscle. See **GENERATION**.

ISCHIOCELE, in *Surgery*, a hernia between the sacrum and ischium.

ISCHIO-COCYGEUS, in *Anatomy*, a name for the coccygeus muscle; which see.

ISCHIUM, one of the divisions of the os innominatum. See **EXTREMITIES**.

ISCHIUM Os, *Fractures of*, in *Surgery*. See **FRACTURE**.

ISCHINAMBLUCIS, in *Natural History*, the name of a genus of fossils of the class of the selenitæ, but one of those which are of a columnar form, not of the common rhomboidal one.

The word is derived from the Greek, *ισχυος*, *thin*, *αμβλυ*, *blunt* or *obtuse*, and *κίον*, *a column*, and expresses a body in form of a thin flatted column, with obtuse ends. The bodies of this genus are of an octohedral figure, consisting of six long planes and about two broken ends. The top and base planes are broader than the rest. The crack which runs through the whole length of bodies of this genus is often filled with clay, which spreads itself into the form of an ear of some grasses; of this genus there are only four known species. Hill.

ISCHNOPHONIA, in *Medicine*, from *ισχυος*, *thin*, and *φωνη*, *the voice*, a term which seems to have been used originally to denote a certain tenuity or smallness of the voice; but the most common acceptation of the word is in the sense of *hesitation of speech*.

ISCHURIA, from *ισχυς*, *I stop*, and *ουρον*, *urine*, signifies an entire suppression or retention of the urine.

The discharge of urine may be altogether prevented or suppressed for a time, from four different sets of causes; whence Dr. Cullen has, with great judgment, arranged the forty-three varieties of *ischuria*, described by Sauvages after Cusson, under four heads or species. These are, 1. *Ischuria renalis*, in which the impediment to the excretion of urine is in the kidneys themselves; 2. *Ischuria ureterica*, in which the impediment consists in an obstruction of the canal of the ureters, through which the urine should pass into the bladder; 3. *Ischuria vesicalis*, in which the urine, secreted by the kidneys, and transmitted through the ureters, is retained in the bladder from disease in that receptacle itself; and, 4. *Ischuria urethralis*, in which the impediment is occasioned by some obstruction in the canal of the urethra, through which the contents of the bladder are discharged. See Cullen. *Synopf. Nosol. Method. Class iv. Ord. 5.* Sauvages, *Class x. Ord. 3.*

The renal ischuria, in which there is little or no secretion of urine effected by the kidneys, is to be distinguished by the following circumstances: It supervenes upon some previous affection of the kidneys, and is accompanied by pain or an uneasy sense of weight in the region of the kidneys, while, at the same time, there is no tumour in the hypogastrium, or lower portion of the belly, such as a distended bladder would occasion, nor any desire to make water. The ischuria, from obstructed ureters, is accompanied by similar symptoms, except that the pain or uneasiness is felt in the course of the ureter; it is likewise unaccompanied by hypogastric tumour, or desire to pass urine. The most frequent causes of these two forms of retention of urine are inflammation of the kidneys or of the ureters, or the presence of calculous concretions in those parts; but other causes have been occasionally observed to produce the disease, such as grumous blood, impacted in the same parts, and purulent matter, or mucus, obstructing the passages. It may be remarked, that some writers have confined the term *retention* of urine to the renal form of the disease, as if they would assert, that, when the urine was not secreted, it was retained in the blood; and they denote the other forms

of the disease by the term *suppression* of urine:—a false hypothesis, but the terms may be retained as expressing the facts. When the retention is connected with inflammation of the kidney or ureter, its cure will depend upon the removal of that inflammatory state. (See NEPHRITIS.) And when it originates from impacted calculus, it must be treated with the remedies resorted to in other calculous cases. See NEPHRALGIA.

The two other species of isehuria, originating from impediments to the evacuation of the bladder, by diseases of that organ itself, or of its outlet, the urethra, are to be distinguished, by the evident tumour of the hypogastrium, above the pubes, and by the frequent urging to make water, accompanied with pain in the neck of the bladder, in the one case, and in some part of the urethra in the other. The causes which give rise to the vesical suppression of urine, are inflammation of the neck of the bladder; stone in the bladder; spasm of the sphincter; palsy extending to the bladder; over-distention of its fibres, from retaining the urine too long; purulent matter, mucus, or grumous blood, lodged in the neck of the bladder; and tumours of the neighbouring parts compressing the neck of the bladder, such as hardened faeces in the rectum, or calculous concretions, stasis, inflammation, abscess, or hemorrhoidal swellings in the same bowel, and also the gravid uterus, or other enlargements of that viscus. The causes of impediment in the canal of the urethra, which occasion suppression of urine, are inflammation of that passage; pus, mucus; or grumous blood impacted in it; stricture; tumours in the perineum; phimosis, &c.

The means by which these causes of suppression of urine are chiefly to be removed, and the disease to be cured, are principally surgical. See *Suppression of URINE*.

ISCHURIA, in *Surgery*. See *Retention of URINE*.

ISEFIORD, in *Geography*, a large bay or gulf of Denmark, on the N. coast of the island of Zealand; the mouth of which lies in N. lat. 55° 59'. E. long. 11° 50'.

ISELASTICS, ISELASTICA, a kind of games, or combats, celebrated in the cities of Greece and Asia, in the time of the Roman emperors.

The victors at these games had very considerable privileges conferred on them; after the example of Augustus and the Athenians, who did the like to the conquerors at the Olympic, Pythian, and Isthmian games. They were crowned on the spot, immediately after their victory; had pensions allowed them; were furnished with provision at the public cost; were carried home in triumph, and made to enter their cities through a breach in the walls; whence their appellation from *εἰσέλαισις*, to enter.

ISELIN, JAMES CHRISTOPHER, in *Biography*, an eminent philologist and divine, was born at Basil in 1681; and having laid a good foundation in grammar learning, he was admitted to his academical course as early as the age of 13, and at 15 he distinguished himself by a Latin poem on "The Passage of the Rhine" by the French, which obtained for him great applause. In 1701 he was ordained minister, and on that occasion published a dissertation on the Babylon of the Revelations, in answer to the bishop of Meaux. In 1704 he accepted the chair of eloquence and history in the university of Marburg, which he occupied with great reputation for two years. In 1706 he was appointed professor of history and antiquities at Basil, and in 1711 he was made doctor in theology, and appointed to teach that science. He was invited to settle at Paris, which he declined, and the French academy elected him to the place of honorary member, vacant by the death of Cuper. This honour was conferred upon him in return for the pains

he had taken to comply with the king's request of obtaining for him copies of the acts of the council held at Basil in the fifteenth century. He died in 1737, and his memory was honoured by a great number of eulogies in Latin and German. The works of M. Iselin consist of orations, dissertations, and detached tracts on a variety of subjects, philological, theological, and miscellaneous. Moreri.

ISELIN, ISAAC, was born at Basil in 1728. He received his academical education at Gottingen, where he paid great attention to jurisprudence and statistics under the most able professors. He undertook the task of reducing the jurisprudence of the Swiss confederation into a system, of which he published a specimen in his thesis, when he obtained the degree of doctor, under the title of "Tentamen Juris publici Helvetici." When he had completed his studies he went to Paris, and obtained the acquaintance and friendship of the most eminent men of letters in that capital. After his return, he applied with great diligence to the study of jurisprudence, and in 1756 he was appointed to the important office of secretary to the grand council of his native city. Soon after he published his first work, entitled the "Dream of Mankind," which has gone through many editions. He next gave the world a work, entitled "Free Thoughts on the Depopulation of my native City," in which he recommended the admision of new citizens. But his most important work was his "History of Mankind," in which he traces the progress of the human mind from a state of rudeness to that of refinement, and shews in what manner nations have emerged from obscurity, and have been completely civilized by the introduction of arts and manufactures. Iselin was the author also of a periodical work, entitled "Ephemerides of Mankind." He carried on an extensive correspondence both in Switzerland and foreign countries, and he wrote many excellent critiques in the "Deutsche Bibliothek," which are said to be distinguished by their acuteness, modesty, and adherence to truth. He died in the year 1782, at the age of 54. Iselin's writings abound with exalted ideas and ingenious thoughts, and display great knowledge of human nature, ardent patriotism, and a strong vigorous mind. Gen. Biog.

ISEN, in *Geography*, a town of Bavaria; 24 miles E.N.E. of Munich.

ISENBURG, UPPER, *County of*, a principality of Germany, situated in the Wetterau, about 30 miles long and 10 broad. The house of Isenburg is divided into several branches, taking their surnames respectively from towns on the estate.

ISENBURG, Lower, a county of Germany, in the circle of the Lower Rhine, formerly governed by courts of its own, as a fief of the electorate of Treves.

ISENBURG, a town of Germany, giving name to the county, situated on the Iser, and surrounded with sharp rocks, on one of which is a castle built by Charlemagne; 10 miles N. of Coblenz. N. lat. 50° 30'. E. long 7° 35'.

ISENBURG, New, a town of Germany, in the county of Isenburg, founded by French refugees; 3 miles S. of Frankfurt on the Main. N. lat. 50° 3'. E. long. 8° 38'.

ISENHAGEN, a town of Westphalia, in the principality of Lüneburg; 24 miles E.N.E. of Zelle.

ISEO, a town of Italy, in the department of the Benaco, on a lake to which it gives name, through which the river Oglio takes its course: the town was anciently called "Sabino;" 12 miles N.W. of Brescia.

ISER, a river of the Tyrol, which rises about 5 miles N. of Innspruck, and, passing by Munich, Landshut, Landau, &c. runs into the Danube, 2 miles below Deckendorf.

ISERE, a river which rises in the Alps, about 12 miles from

from mount Cenis, in a mountain called "Iseran," in the duchy of Savoy, and, after entering France, passes by Grenoble, &c. and joins the Rhone, about 3 miles above Valence; navigable for boats as far as Montmelian.

ISERE, formerly *Grafsvaudan* and *Viennois*, one of the 11 departments of the eastern region of France, so called from the river Isere, which crosses it; situated in N. lat. $45^{\circ} 30'$, W. of Mont Blanc: containing 452 square leagues, and 441,208 inhabitants, and divided into four districts, viz. *Vienne*, including 104,689 inhabitants; *Tour-du-Pin*, having 99,053; *Grenoble*, 169,623; and *St. Marcellin*, 67,843 inhabitants. Its number of cantons is 44, and that of communes 558. The annual contributions amount to 3,546,809 francs, and the expenses charged upon it to 338,804 francs 37 cents. This department consists of barren and marshy plains, deep valleys, and high mountains partially wooded. The chief products are grain, hemp, roots, some good wine, and excellent pastures. It has mines of iron, copper, lead, coal, quarries, and mineral springs. Its capital is Grenoble.

ISERINE, in *Mineralogy*. See TITANIUM.

ISERLOHN, or LOHN, in *Geography*, a town of Germany, in the county of Mark, inhabited by Lutherans, Calvinists, and Roman Catholics, who are allowed their separate worship. Its manufactures are considerable in iron, tin, ribbons, velvets, silks, stuffs, &c.; 32 miles N.E. of Cologne. N. lat. $51^{\circ} 18'$. E. long. $7^{\circ} 40'$.

ISERNIA, a town of Naples, in the Molise, situated at the foot of the Apennines, the see of a bishop; 12 miles W.S.W. of Molise. N. lat. $41^{\circ} 38'$. E. long. $41^{\circ} 2'$.

ISERTIA, in *Botany*, was so named in honour of Mr. Isert, a German botanist, and surgeon in the Danish service, on the coast of Guinea.—Schreb. 234. Willd. Sp. Pl. v. 2. 242. Mart. Mill. Dict. v. 2. Vahl. Eclog. p. 2. 27. Lamarck Illustr. t. 259. (Guettarda; Juss. 207. Aubl. Guian. v. 1. 317.) Class and order, *Hexandria Monogynia*. Nat. Ord. *Rubiaceae*, Juss.

Gen. Ch. Cal. Perianth of one leaf, superior, coloured, four or six-toothed, permanent. Cor. of one petal, funnel-shaped; tube long, cylindrical, slightly curved; limb divided into six, subovate, rather erect, villose segments. Stam. Filaments six, very short, within the throat of the corolla; anthers linear, affixed to the back, erect. Pist. Germen inferior, roundish; style thread-shaped, surrounded by a glandule at the base; stigma six-cleft. Peric. Fruit pulpy, somewhat globular, crowned by the calyx, six-celled; the cases of the cells brittle. Seeds numerous, small, angulated, rough.

Eff. Ch. Calyx superior, six-toothed. Corolla funnel-shaped, six-cleft. Stigma six-cleft. Fruit six-celled, many-seeded.

1. *I. coccinea*. Willd. n. 1. (Guettarda coccinea; Aubl. Guian. v. 3. t. 123.)—Leaves lanceolate-elliptical, clothed with hoary pubescence, acuminate, acute at each end. Flower-stalks branched, bifid. A native of woods in Guiana, flowering and bearing fruit at all seasons.—This tree rises to the height of ten or twelve feet, is furnished with erect, knotty, square branches. Leaves opposite, large, ovate, acute, green above, downy beneath, dark-coloured, with reddish nerves. Stipules long, broad, acute, deciduous. Flowers racemose, erect, terminal; their partial-stalks opposite, furnished with two little scales. Calyx purplish. Tube yellow. Fruit red.

2. *I. parviflora*. Willd. n. 2.—"Leaves oblong, the lower ones somewhat heart-shaped at the base. Bunch of flowers ovate."—Found in the island of Trinidad.—Leaves generally smooth, sometimes rather villose beneath.

ISSETSK, in *Geography*, a town of Russia, in the government of Tobolsk, on the Isset, which runs into the Tobol; near Yalutorovsk; 44 miles W.S.W. of Yalutorovsk.

ISGAARD, a town of Denmark, in North Jutland, situated on a peninsula in the Baltic; seven miles E.N.E. of Aarhus.

ISGAUR, ISGURIAH, or *Ishuria*, anciently called "Diocouria," and "Sebastopolis," a town of Mingrelia, on the E. coast of the Black sea, with a road for ships, which in summer is tolerably good. In 1672 it was burned down by the Abikas, who were invited by the prince of Mingrelia to assist him against the Turks. N. lat. $43^{\circ} 18'$. E. long. $40^{\circ} 32'$.

ISHMAELITES, in *Ancient Geography* and *History*, the descendants of Ishmael, the son of Abraham by Hagar, his Egyptian bond-maid. Ishmael was born in the year B. C. 1910, and his name, founded on a circumstance which afforded relief to his mother, when she was wandering from her master's house towards Egypt, her native country, is derived from the Hebrew שְׁמַעְיָא, formed of שָׁמַע, *shamah*, to hear, and אֱל, *el*, God, and denoting "the Lord hath hearkened!" The heavenly messenger who appeared to Hagar in the wilderness, and instructed her by what name to call her future son, predicted also that he and his posterity would prove fierce and warlike, engaged in repeated hostilities, and yet able to maintain their independence. Hagar, deriving encouragement from this circumstance, returned to the house of Abraham, and was soon delivered of her promised son. The father regarded Ishmael as the heir of his wealth, till Sarah had the promise of her son Isaac. After the birth of Isaac, Abraham was persuaded by his wife to dismiss Hagar and her son; and the patriarch probably provided for their subsistence in some distant situation, where they could not encroach on the patrimony of Isaac. Having wandered for some time in the wilderness of Beersheba, they proceeded farther to the wilderness of Paran, which bordered on Arabia, and here Ishmael arrived at maturity, and became an expert archer, or a hunter and warrior. In process of time his mother procured for him a wife out of Egypt, by whom he had twelve sons, who eventually established themselves as the heads of so many distinct Arabian tribes. Accordingly the descendants of Ishmael are mentioned in history, under the general name of Arabians and Ishmaelites. Of Ishmael's personal history, we merely learn from the sacred writings, that he joined with his brother Isaac in paying the last tribute of respect to the remains of their father; and that he died at the age of 137 years (B. C. 1773.) Gen. xxv. 9-18. His descendants, according to the scripture account, spread themselves "from Havilah to Shur, that is before Egypt, as thou goest into Assyria." From this brief statement, we may conjecture how far their territory extended; for Havilah, according to the generality of writers, was situated near the confluence of the Tigris and Euphrates, and Shur, on the isthmus which separates Arabia from Egypt, now called the isthmus of Suez. From thence we may well imagine, that they spread themselves on both sides so far as to have taken possession of the greatest part of Arabia; and, indeed, Josephus (Antiq. l. i. c. 13.) does not scruple to style their progenitor the founder of the Arabian nation. See ARABIA.

ISI, in *Hindoo Mythology*, is a name of the goddess Parvati, consort of Siva, in his form of *Isa*; which see.

ISIA, *Isuz*, feasts and sacrifices anciently solemnized in honour of the goddess Isis.

The Isia were full of the most abominable impurities; and for that reason, those who were initiated into them

were obliged to take an oath of secrecy. They held for nine days successively, but grew so scandalous, that the senate abolished them at Rome, under the consulate of Piso and Gabinius. They were re-established by Augustus, and the emperor Commodus himself assisted at them, appearing among the priests of that goddess with his head shaven, and carrying the Anubis.

ISIAC TABLE is one of the most considerable monuments of antiquity, being a plate of copper or brass, discovered at Rome, in 1525, and supposed by the various figures in bas relief upon it, to represent the feasts of Isis, and other Egyptian deities.

With regard to the history of this monument, we may observe, that the copper or brass ground was overlaid with a black enamel, artificially intermixed with small plates of silver. When, in the year 1525, the constable of Bourbon took the city of Rome, a locksmith bought it from a soldier, and then sold it to cardinal Bembo, after whose death it came into the hands of the duke of Mantua, and was kept in that family till it was lost at the taking of that city by the Imperialists in the year 1630, nor has it been ever heard of since. By good fortune it had been engraved in its full proportion, and with all possible exactness, by *Aeneas Vico* of Parma. This tablet was divided into three horizontal compartments, in each of which were different scenes, containing different actions. Those compartments are, as it were, different cartouches, distinguished sometimes by single strokes only, but oftener by a very large *fascia*, which is full of hieroglyphics, that is, of that mysterious writing, consecrated by the ancient Egyptians to the mysteries of religion. The four sides of the table were inclosed with a border, filled up, like the ground, with several figures of the Egyptian gods, and with a great number of hieroglyphics. There have been various opinions as to the antiquity of this monument: some have supposed that it was engraved long before the time when the Egyptians worshipped the figures of men and women. Others, among whom is bishop Warburton, apprehend, that it was made at Rome, by persons attached to the worship of Isis. Dr. Warburton considers it as one of the most modern of the Egyptian monuments, on account of the great mixture of hieroglyphic characters which it bears.

It has been also a question, whatever may be thought of the antiquity of this tablet, whether it only represents the mysteries of Isis, whose figure, placed in a sort of niche, occupies the centre; or whether it contains the principal points of the Egyptian theology, since all their gods are here represented. Pignorius, Kircher, and Chifflet, have offered their various conjectures concerning the design and meaning of this monument. The abbé Banier (in his "Mythology, &c." vol. i. p. 567.) declares it to be his opinion, that it was a votive table, which some prince, or private person, had consecrated to Isis, as an acknowledgment for some benefit which he believed she had conferred upon him. That goddess occupies the principal place in it, and the design of varying her attitudes and symbols, must have been to point out to us, in how many different modes she was represented, as well as the different sacrifices that were offered to her. Accordingly, three sorts of these are there to be observed, one of animals, another of plants, and a third of libations. Perhaps the person who had consecrated this table to Isis, had offered to her all these sorts of sacrifices, either for having been cured of some severe disease, or for having been delivered from some great danger, to which he had been exposed by sea; for that goddess was equally invoked in diseases, and when people were entering upon a long voyage; since the epithets of "Salutaris" and

"Pelagia" were added to her name. Nothing was more common than the votive tables, consecrated to Isis. All the temples of this goddess were full of them; and works of that sort procured a living to great numbers of painters, as we learn from Juvenal (Sat. 18.):

"Et quam votivâ testantur fano tabellâ
Plurima, Pictores quis nescit ab Iside pasci."

ISIACI, priests of the goddess Isis. Dioseorides tells us, that they bore a branch of sea-wormwood in their hands instead of olive. They sing the praises of the goddess twice a day, viz. at the rising of the sun, when they opened her temple; after which they begged alms the rest of the day, and returning at night, repeated their orisons, and shut up the temple.

Such was the life and office of the Isiaci; they never covered their feet with any thing but the thin bark of the plant papyrus, which occasioned Prudentius and others to say they went bare-footed. They wore no garments but linen, because Isis was the first who taught mankind the culture of this commodity. See Diodorus Siculus, and Plutarch's Isis and Osiris.

ISIDORE of Pelusium, in Biography, a celebrated disciple of St. John Chrysostom, and distinguished in the Greek and Roman calendars by the epithet of "Saint," was by birth an Egyptian; and flourished, as the contemporary of Nonnus, and, according to Cave, about the year 412. As his name does not occur after the year 433, he probably died before the middle of the fifth century. He embraced the monastic life at Pelusium, and acquired, by his austerities and indefatigable application to literary studies, high reputation for sanctity, learning, and eloquence, so that he was honoured by the Greeks with the appellation of "the famous." Facundus says, that he wrote 2000 epistles for the edification of the church; and Suidas ascribes to him 3000, explanatory of the scriptures. Of these there are still extant 2012, in five books; of which Mosheim speaks in terms of high commendation: saying of them, that though they are short, they are admirably written, both with respect to the solidity of the matter, and the purity and elegance of their style. He adds, that they manifest more piety, genius, erudition, and wisdom, than are to be found in the voluminous productions of many other writers, and that they cast a considerable degree of light upon several parts of scripture. Dr. Lardner, citing a dissertation of Dr. Heumann on Isidore of Pelusium (apud Primitias Gottingenses, Hanover, 1738, 4to.), informs us, that this learned writer argues, that most of Isidore's letters are fictitious, and not a real correspondence; and, says Lardner, he seems to have proved what he advances. Isidore has largely quoted all, or most of the canonical books of the Old Testament; but he very seldom quotes any apocryphal books. He also often cites the four gospels, the acts of the apostles, and all St. Paul's epistles, except that to Philemon. He likewise quotes and explains passages of the epistle of James, the first and second epistle of Peter, and the first epistle of John. He explains the 8th verse of the second epistle of John, and there is no reason to doubt his having received the other. He explains a passage of the epistle of Jude; and uses several expressions that seem to have been taken from the book of Revelation: so that, upon the whole, his canon of scripture was the same as our's. Isidore had a great respect for the scriptures, and often recommends the perusal of them. The best edition of his works was published at Paris, in Greek and Latin, 1638, folio. Cave. Dupin. Mosheim. Lardner.

ISIDORE of Seville, was an eminent bishop of this city in Spain

Spain for 40 years, from the year 595 or 596 to 636. He was the son of Severianus, governor of Carthagera, and brother of Leander, bishop of Seville, who had the care of his education. He presided at a council held in Seville in 619, and at another in Toledo in 633; in which measures were adopted that served to reform the lax state of ecclesiastical discipline and manners in Spain. He was a voluminous writer, and his works are enumerated by Dupin and Lardner; and the best edition of them was published at Paris, in 1601, by father James du Breuil, a Benedictine monk, in folio. As a writer, he is characterized more by learning and pedantry, than by judgment, taste, or accuracy. Mosheim reckons him among those authors, who gave rise, by their collections, to that species of divinity, which was afterwards distinguished by the Latins under the denomination of "positive theology." Dupin, though he represents him as a prodigy of learning, and an oracle, admits that he wanted genius, and a discriminating judgment; and that his opinions are often false, and his remarks trivial, and frequently erroneous; and that his style is rather perspicuous than eloquent or polished. Isidore received all the same books of the New Testament which we receive; and he speaks of them with great respect, stating that they contain the precepts of life and the rule of faith, and that they may be profitably read by all sorts of men. This Isidore is sometimes called "the younger," to distinguish him from Isidore, bishop of Cordova, in the fifth century, who wrote "Commentaries on the two Books of Kings," which he dedicated to Paul Orosius, the disciple of St. Augustine. Cave. Mosheim. Dupin. Lardner.

Isidore was a man of great and extensive learning, but particularly, it is said, in geometry, music, and astrology, which, in the time of Isidore, was another name for astronomy.

His book on the holy offices contains the principal points of discipline and ecclesiastical polity. He is frequently ranked among musical writers. In his treatise on the divine offices, much curious information occurs concerning canto fermo, and music in general; but particularly its introduction into the church, the institution of the four tones by St. Ambrose, and the extension of that number to eight by St. Gregory. In treating of secular music, he has a short chapter on each of the following subjects: of music, and its name: of its invention: its definition: of its three constituent parts, harmonics, rhythm, and metre: of musical numbers: of the three-fold divisions of music; 1st, Of the harmonical division of music; 2dly, Of the organic or instrumental division; 3dly, Of the rhythmical division.

These chapters are very short, and contain little more than compressed definitions of musical terms. In enumerating the seven liberal arts, cap. ii. he ranks them in the following manner: grammar, rhetoric, logic, arithmetic, music, geometry, astronomy. Isidore died in the year 636, and is enrolled among the saints of the Romish calendar.

ISIDORE, MERCATOR, or PECCATOR, the name given to the author of a collection of canons, which for some time were attributed to Isidore of Seville, is supposed to have flourished towards the close of the eighth century. This collection contains the pretended decretals of more than sixty popes, which are followed by the canons of the councils which were held in Greece, Africa, France, and Spain. They are generally considered as spurious, of which there is abundant internal evidence, arising from the style, the incorrectness of their dates, and from many historical, geographical, and chronological errors. They were invented for the purpose of strengthening the already overgrown power of the church, and to enforce the belief that the

bishop of Rome was constituted and appointed by Jesus Christ as supreme legislator and judge of the church universal; and that, therefore, the bishops derived all their authority from the Roman pontiff, nor could the councils determine any thing without his permission and consent. Though the forgery was manifest to every thinking person, yet with the great mass of the people it produced the intended effect, and contributed to enrich and aggrandize the Roman pontiffs, and exalt them above all human authority and jurisdiction. Moreri. Mosheim.

ISIDORE of Charax, a Greek author, in the time of Ptolemy Lagus, about three centuries before the Christian era, composed several historical works, and a description of Parthia, which has been published by Hefchelius, and likewise at Oxford, among the collection of the lesser geographers. It is entitled "Mantiones Parthicae."

ISIDORO, Sr., in *Geography*, a town of California; 30 miles N.N.W. of Loreto.

ISIGNY, a town of France, in the department of Calvados, and chief place of a canton, in the district of Bayeux; 29 miles W.N.W. of Caen. The place contains 1829, and the canton 13,651 inhabitants, on a territory of 240 kilometres, in 29 communes. N lat. 49 19. W. long. 1.— Also, a town of France, in the department of the Channel, and chief place of a canton, in the district of Mortain; 9 miles W. of Mortain. The place contains 358, and the canton 5708 inhabitants, on a territory of 75 kilometres, in 11 communes.

ISIKOVA, a town of Japan, in the island of Niphon; 20 miles S.W. of Kanazawa.

ISIMA, a town of France, in the department of the Dora; 19 miles E. of Aosta.

ISIME, a town of Thibet; 25 miles E. of Harachar.

ISINDI, in *Ancient Geography*, an episcopal town of Asia, in the second Pamphylia.

ISINDUS, or ISINDA, a town of Asia, in Ionia.

ISINGLASS, a name given to Muscovy talc, and to *Ichthyocolla*; which see. See also GLUE.

ISINGLASS *Fish*, in *Ichthyology*. See ACIPENSER and HUSO.

ISIS, in *Ancient Geography*, *Tchorok*, a river of Asia, in the Colchide, which, according to Arrian, was navigable; and he places it between the mouth of the Acinasis and that of Mogra, about 90 stadia from the one and the other.

ISIS, in *Geography*, a name frequently given to the river Thames, before it joins the Thame at Dorchester; but this river is only a branch of the Thames, which rises near Minchinhampton in Gloucestershire, and joins the main stream near Lechlade.

ISIS, in *Mythology*, a goddess of the ancient Egyptians, worshipped by them and many other nations.

ISIS, according to some, is synonymous with *παλαια*, ancient or aged, an expression which, in the Egyptian theology, was appropriated to the moon, on account of her eternal birth. According to others, and particularly Jablonki, (*Pantheon Egyptiacum*, vol. ii.) Isis, in the Egyptian language, signified "the cause of abundance;" and it was applied by the Egyptian priests to the moon, because they supposed, in consequence of attention to the phenomena of nature, that the moon has a direct influence on the atmosphere, the winds, and the rains; and therefore they regarded it, like the sun (which they called Osiris), as one of the sources of the inundation of the Nile. Hence they were led to characterize this beneficial effect, by denominating the cause of it Isis. This is said to have happened 320 years after the exodus of the Israelites; at which period they bestowed surnames on the sun and moon, proper to fix their discoveries, and presented the people with a new theology.

logy. According to Herodotus and all the ancients, Osiris and Isis were the two great divinities of the Egyptians, and the most generally worshipped in the whole country; and, indeed, almost the whole mythology of those ancient people is comprehended under what their priests fabled about them. The Greek and Latin authors extend still farther this Egyptian mythology concerning Isis and Osiris, since, according to them, they comprehended all nature, and all the gods of that ancient people. According to Herodotus, the Egyptians took Isis for Ceres, and believed that Apollo and Diana were her children, and that Latona had only been their nurse; differing from the Greeks, who regarded her as their mother. According to the same author, Apollo and Orus, Diana and Bubastis, Ceres and Isis, are the same; and hence it is, he says, that Æschylus makes Diana the daughter of Ceres. Moreover, the mythologists assert, that Isis and Osiris included, under different names, all the gods of paganism; since, according to them, Isis is Terra, Ceres, Juno, the Moon, Minerva, Cybele, Venus, Diana, and, in one word, all nature: and hence, as they pretend, this goddess was called Myrionyma, that is, who has a thousand names. Osiris also, in their opinion, is Bacchus or Dionysius, the Sun, Serapis, Pluto, Ammon, Pan, Apis, Adonis, &c. It is difficult to ascertain the real origin of Isis amidst these mythological fables. Some have pretended that the fable of Isis came originally from Greece; and they have confounded that goddess with Io, the daughter of Inachus, king of Argos. The fable of Io is recited by Ovid in his "Metamorphosis," (l. 38.) and this fable has been differently understood and explained by various authors. It is allowed that there was in Greece a princess named Io, the daughter of Inachus, or, as Pausanias says, of Jafus; and the Greeks took occasion to confound Isis and Io, in consequence of the introduction of the worship of Isis into Greece, especially into the city of Argos. Inachus taught the Greeks to pay honour to Isis, and hence they looked upon her as his daughter. Jablonski says, that the Egyptians, from remote antiquity, worshipped the moon, under her proper name of "Ioh," which, in the Egyptian language, signifies the moon; and that Inachus, the first king of Argos, carried this worship into Greece, nearly 300 years before the birth of Moses. It is there, says Eustathius, that a cow is the symbol of Io, or the moon; for in the Argian language, the moon is called Io. The Grecian fable, on the other hand, makes Io cross the sea from Greece, metamorphosed into a cow, and conducts her into Egypt, where she receives the name of Isis. Accordingly, Lucian, well versed in ancient mythology, puts these words into the mouth of Jupiter, "Conduct Io to the banks of the Nile, across the waves of the sea. Let her become Isis: let her be the goddess of the Egyptians; let her augment the waters of the river, and let loose the winds." As the Nile began to increase at the new moon which follows the solstice, the Egyptian priests, who regarded this planet as the mother of the winds, decreed to her the honour of this phenomenon. "Isis," says Servius, (Obs. on the Æneid. l. 8.) "is the genius of the Nile. The sistrum she bears in her hand indicates the increase and the flowing of the waters; the vase she holds in her left marks their abundance in all the canals." Temples were erected to her in the different provinces, and she had altars and sacrifices throughout the whole country. "Coptos," says Eustathius, "is a city of the Thebais, where Io is adored under the name of Isis. It is on her festivals that they celebrate with the sistrum the increase of the Nile." The people, from the allegorical language of the priests, imagined that they owed this bounty to the tears of that divinity. The Egyptians, according to

Pausanias, were persuaded that the tears of Isis had the virtue to augment the Nile, and to make it rise up into the country. Savary, in his "Letters on Egypt," says, that the Copts are not yet cured of this superstition.

Notwithstanding the fabulous pretensions of the Greeks with regard to the origin of Isis, and their attempts to identify her with their Io, the Egyptians, according to Diodorus Siculus (l. i.) and Plutarch (De Is. et Osir.) assert that this princess was born in their country; that she married Osiris, that they lived together in perfect harmony, and that they concurred in their endeavours to polish and civilize their subjects, to teach them agriculture, and several other necessary arts of life. Diodorus adds, that Osiris, determining on an expedition to India for purposes of civilization, settled Isis regent of his kingdom. (See BACCHUS.) On his return to Egypt he found that his brother Typhon had formed a party against the government. Typhon, however, resisted the gentle means used by Osiris for subduing his ambitious spirit, and, under a pretence of hospitality, confined him in a chest exquisitely wrought, and threw it into the Nile. When Isis heard of her husband's tragical end, she made diligent search for the corpse, and having found it in Phœnicia, was allured by the king of Byblos to carry it off to Egypt. Having lamented over it, she at length caused it to be interred at Abydos, a town situated to the west of the Nile. In the mean time Typhon was contriving to secure his new empire, but Isis, being recovered from her distress, collected her troops, and placed them under the conduct of Orus, her son, who pursued the tyrant, and vanquished him in two pitched battles. (See TYPHON.) Isis having died some time after her son's victory over Typhon, the Egyptians paid adoration to her with her husband Osiris, as to divinities; and because they had applied themselves, during their reign, to teach agriculture, the ox and the cow became their symbols. Festivals were instituted to their honour, in which several infamous rites were afterwards introduced. There the infamous image of the Phallus which Isis had consecrated, was carried in procession, and it became the symbol of fruitfulness, though in its original institution it had only been the mark of Isis's passion for Osiris her husband. Diodorus Siculus has recorded the following inscription on an ancient monument, by which Isis was characterized. "I, Isis, am the queen of this country. And I had Mercury for my prime minister. None had power to hinder the execution of my orders. I am the eldest daughter of Saturn, the youngest of the gods. I am the sister and the wife of king Osiris. I am the mother of king Orus. I am the who resides in the dog-star. The city of Bubastis was built in honour to me. Rejoice, O Egypt, thou that hast been to me instead of a nurse, and mother." The following inscription, according to Plutarch (De Is. et Osir.) was engraved upon the pavement of Minerva's temple. "I am all that has been, that is, and that shall be, and none among mortals has hitherto taken off my veil."

The Egyptians, having called the moon Isis, or the cause of abundance, applied this epithet to the earth, as the mother of fruits. We know, says Macrobius (Saturn. l. i.), that Osiris is the sun, and Isis the earth. Isis, in the Egyptian language, adds Servius, means the earth. In this point of view, she has a striking affinity to the Ceres of the Greeks; and this agrees with the account given of her by Herodotus (l. ii.). Plutarch informs us, that the priests honoured only with the name of Isis that part of Egypt which was watered by the Nile, and in allusion only to her fecundity: he adds, that, in the sacred language, they termed the inundation, the marriage of Osiris with Isis.

Isis is reported by Diodorus Siculus to have invented many
excellents

excellent medicines: and hence, says he, after she was received among the number of the deities, she was applied to for the cure of distempers; and frequently indicated remedies by dreams. Galen takes notice of some plasters which bear her name. Banier's Mythology, vol. i. Savary's Letters on Egypt, vol. ii. See BUBASTIS, ORUS, OSIRIS, and SOTHIS.

ISIS, in Zoology, a genus of Zoophytes of a ramose or plant-like form, the stem and branches of which are composed of stony articulations, longitudinally striated, united by spongy or horny junctures, and covered, when living or in a recent state, by a soft porous cellular flesh or bark; and the mouths beset with oviparous polypes. The species of this family are entirely of the marine kind, and mostly inhabitants of the Indian seas.

Species.

HIPPURIS. Joints white with black junctures. *Isis hippuris*, Linn. *Sertularia ramosissima*, &c. Hort. Clifford. *Isis*, Pallas, Ellis, &c. *Hippuris favea*, Clutius. *Accabarium album*, Rumpf. *Lithophyton*, &c. Gualt.

A native of the Indian seas, where it is found growing to rocks, and is from six inches to two or three feet in height. The flesh, when recent, is bright orange or red, the bone or stony part, as in the dried state, whitish. A variety is described by Esper under the name of *Isis elongata*.

DICHOTOMA. Stem coralline, with smooth joints and decorticated junctures. Gmel. *Isis articulata filiformis*, &c. Pallas. *Hippuris coralloides carnea capensis*, Petiver.

This species is somewhat flexible, about six inches in height, with flesh-coloured joints, and flesh of a cinnabar colour, beset with convex papillæ. It inhabits the seas of India and Ethiopia.

OCHIRACEA. Stem coralline, with decorticated joints and knotty junctures. Gmel. *Lithoxylon*, &c. Hort. Clifford. *Isis articulata paniculato-dichotoma ramosissima explanata, cortice hinc papilloso*, Pallas. *Isis*, &c. Soland. *Corallium rubrum indicum*, Ellis Phil. Transf. *Accabarium rubrum*, Rumpf. *Pseudocorallium croceum*, Ray. *Hippuris favea fulvo-rubra conchianica*, Moris. *Accabaar seu corallodendron vulgare rubrum*, Seba.

Inhabits the seas of the East Indies; the colour deep-red, or sometimes white, with the junctures brownish-yellow; the stem irregularly grooved, the branches numerous, dichotomous and spread, the joints connected by yellow spongy knobs; flesh yellow, with numerous stellated mouths, the habitations of polypes, each of which is furnished with eight claws.

ENTROCHIA. Stem testaceous, round, with orbicular perforated joints and verticillated dichotomous branches. Gmel.

Stem about three quarters of an inch in thickness, with crowded flat orbicular joints, perforated in the centre, the perforations pentangular, with the disk somewhat striated from the centre, the outer bark unequal and surrounded with a row of tubercles: branches thin, dichotomous, continued and not jointed. Inhabits the ocean.

ASTERIA. Stem testaceous, jointed, pentagonal; the branches verticillated with a terminal dichotomous star. Gmel. *Eucrinus capite stellato ramoso dichotomo pentagono equisetiformi*, Ellis Phil. Transf. *Palma marina e Martinica*, Guettard Aët. Parif.

Found in the seas about the island of Barbadoes. Neither this nor the species preceding, though retained under the genus *Isis*, upon the authority of Gmelin, can with propriety be considered as appertaining to that genus, or perhaps to any other, at present established among naturalists. They unquestionably belong to a race of creatures whose manners,

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and even structure, are not at this time very clearly understood.

COCCINEA. Stem jointed, slender, very red, and somewhat striated; joints united by short yellowish spongy junctures; flesh on the outside covered with small scarlet prominent cells, each furnished with a mouth. Solander.

A diminutive kind of coral, with irregularly spreading branches, and which rarely exceeds the height of two or three inches. It is a native of the Indian ocean, and is sometimes found entirely white.

ISIT, in Geography, a town of Russia, in the government of Irkutsk, on the Lena. N. lat. 61°. E. long. 123° 50'.

ISKA, a name given by the ancients to a light kind of agaric, growing to the old stumps of the oak, hazel, and other trees. This being a very light kind of fuel, was used by the ancients in the manner of a cautery, as we have learned from the Indians to use moxa, or the down of mugwort leaves.

ISKARSKOIGOROD, in Geography, a town of Russia, in the government of Tobolsk. N. lat. 60° 5'. E. long. 59° 14'.

ISKASKAMAGTI, a lake of Canada; 84 miles N.W. of Quebec. N. lat. 47° 50'. W. long. 72° 25'.

ISKIM, a river of Persia, which runs into the Arabian sea, N. lat. 25° 45'. E. long. 57° 9'.

ISKOLDZ, a town of Lithuania, in the palatinate of Novogrodek; 30 miles S. E. of Novogrodek.

ISKOROSE, a town of Poland, in Volhynia; 48 miles N. of Zytomiers.

ISLA, JOSEPH FRANCIS DE, in Biography, a Spanish Jesuit of Madrid, who, after the destruction of his order, retired to Italy, and died at Bologna in 1781. He was author of a satire on the ignorance and vices of the monks, entitled "Historia del Fra. Gerundio de Compazas alias Zotes," which the supreme council of Castile was obliged to suppress. It has been translated into English and German, and it is said that since the time of Cervantes, no Spanish writer has displayed so much wit and humour. Gen. Biog.

ISLA, in Geography, a river of Scotland, which rises in the shire of Angus, and runs into the Tay, 10 miles N. of Perth.

ISLA. See ILA.

ISLAM. See MAHOMETANS.

ISLAMABAD, a town of Bengal, and capital of the province of Chittigong, situated on the river Chittigong, or Currumpelly, about 12 miles from the bay of Bengal. N. lat. 22° 20'. E. long. 91° 45'.—Also, a small province of Bengal, between Goragot and Patladah.

ISLAMNAGUR, a town of Hindooistan, in the circar of Bopal; 10 miles N.N.E. of Bopaltol.

ISLAMPOUR, a town of Hindooistan, in the circar of Nagore; 36 miles N.E. of Didwana.—Also, a town of Hindooistan, in Bahar; 28 miles S. of Patna. N. lat. 25° 8'. E. long. 85° 43'.—Also, a town of Hindooistan, in Vi-fiapour; 15 miles S.W. of Currer.—Also, a town of Hindooistan, in the circar of Jyenagur; 70 miles N.N.W. of Jyepour.

ISLAMTI, a town of Asiatic Turkey, in Caramania; 30 miles S.S.E. of Kaifarich.

ISLAND, or ISLE, a tract of dry land encompassed with water; either with the sea, a river, or lake. In which sense island stands contradistinguished from continent, or terra firma.

Some conclude that islands are as ancient as the world, and it is by no means probable, that the large islands far remote from the continent are new, or that they either arose

out of the sea, or were torn from the main land. Nor is it less certain, that there have been new islands formed by the casting up of vast heaps of clay, mud, sand, &c. as that, for instance, of T'fongming, in the province of Nanquin, in China: or by the violence of the sea, which has torn off large promontories from the continent, as the ancients imagined Sicily, and even Great Britain, to have been formed. It is also certain, that some have emerged above the waves, as Santorini formerly, and three other isles near it in later times; the last in 1707, which rose from the bottom of the sea, after an earthquake, that was supposed to have loosened it from its hold.

Several naturalists are of opinion, that islands were formed at the deluge: others think they have been rent and separated from the continent by violent storms, inundations, and earthquakes. These last have observed that the East Indies, which abound in islands more than any other part of the world, are likewise more annoyed with earthquakes, tempests, lightnings, volcanos, &c. than any other part.

Varenius thinks most of these opinions true in some instances, and believes that there have been islands produced each of these ways. St. Helena, Ascension, and other steep rocky islands, he supposes to have become so, by the seas overflowing the neighbouring champaigns. By the heaping up huge quantities of sand, and other terrestrial matters, he thinks the islands of Zealand, Japan, &c. were formed: Sumatra and Ceylon, and most of the East Indian islands, he rather thinks, were rent off from the main land; and concludes, that the islands of the Archipelago were formed in the same way; imagining it probable, that Deucalion's flood might contribute towards it. Many islands in the South sea are formed by banks of coral, the production of insects. For an account of these by Alexander Dalrymple, eqq. see the *Philosophical Transactions*, vol. lvii. p. 394.

The ancients had a notion, that Delos and some few other islands rose from the bottom of the sea; which, how fabulous soever it might appear, agrees very well with some later observations. Seneca takes notice, that the island of Therasia rose out of the Ægean sea in his time, of which the mariners were eye-witnesses. Concerning the legal occupancy and property of new islands, see ALLUVION.

Islands may be considered under six different heads, with a view to their structure or subterranean geography: 1. Such as consist of an unstratified mass, as of granite, basalt, &c. of which some small rocky islands appear to consist. 2. Of mantle-shaped strata, as M. Werner has named those that surround a central hump or mass, from which they dip in all directions: the projection of such islands above the water being occasioned by an original hump in the strata. 3. They are occasioned by hummocks, or piles of strata, left when the surrounding strata were denuded, or excavated for the bed of the sea: England seems separated from France by this cause. 4. By lifted tracts of strata: it will only be practicable to distinguish this case from the last in islands near to others, or to a continent, in which the same strata are found on the opposite coasts, by which to observe, whether the island tract has risen, or the intermediate part sunk which forms the channel of separation. 5. To volcanic eruptions in the bottom of the sea: such are generally of modern formation compared with the antiquity of the four preceding classes, and have, several of them, appeared within the periods of history; and, 6. To gravel sand and silt thrown up by the waves and tide, and accumulated in height by the blowing of the sands from the beach, until small islands are thus raised permanently above the level of the sea; some of them without assistance from man, but the greater part of the newly formed islands on the coasts of the

ocean have been gained, and are preserved by artificial banks, from the overflowings of the high tides. In large islands, like England, great varieties of these cases will doubtless be found to obtain in their structure: the eastern sides of the greater part of the islands are, perhaps, the flattest, and the western sides the most abrupt, owing to the strata dipping towards the east, but it is by no means true, that the western sides of islands and continents are always the most abrupt, since often, the strata dip to the west, as they do and pass under the sea, in the coal works at Whitehaven and Workington in Cumberland.

ISLANDS, Floating. Histories are full of accounts of floating-islands; but most of them are either false or founded on exaggerations. What we generally see of this kind is no more than the concretion of the lighter and more viscous matter floating on the surface of water in cakes, and with the roots of plants, forming congeries of different sizes, which not being fixed to the shore in any part, are blown about by the winds, and float on the surface. These are generally found in lakes, where they are confined from being carried too far; and from being broken by the agitation of the water. And in process of time some of them acquire a very considerable size. Seneca tells us of many of these floating islands in Italy; and some later writers have described not a few of them in other places. But however true the histories of these might have been at the time when they were written, there remain very few proofs of their truth at this time, these islands having either disappeared again, or having been fixed to the sides, in some part, in such a manner as to have made a part of the shore. Pliny tells us of a great island, which at one time swam about in the lake Cutilia, in the country of Reatinum, which was discovered to the old Romans by an oracle: and Pomponius tells us, that in Lydia there were several islands so loose in their foundations, that every little accident shook and removed them. Herodotus speaks also very largely of the lake Chemnis in Ægypt. See *ABSORPTIONS of the Earth*.

ISLANDS, Fortunate. See FORTUNATE.

ISLANDS, Volcanic. See VOLCANO.

Gryphander has written a Latin treatise expressly on islands, "*De Insula*."

ISLAND Bay, a bay on the E. coast of the island of Paraguay. N. lat. $6^{\circ} 15'$ E. long. $118^{\circ} 83'$.

ISLANDS, Bay of. See BAY.

ISLANDS, Bayona. See BAYONA Islands.

ISLAND Magee, a peninsula on the east coast of the county of Antrim, Ireland, forming one side of the lough, or harbour of Larne.

ISLAND, or Iceland Crystal. See CRYSTAL.

ISLAND-Fish, in the *Fish-trade*, a name given to the common cod-fish, when it has been caught and preserved in Iceland.

ISLAS ESTOLAS, in *Geography*, a cluster of small islands in the Atlantic, near the coast of Spain. N. lat. $42^{\circ} 12'$ W. long. $8^{\circ} 55'$.

ISLAS Medas, three small islands in the Mediterranean, near the coast of Spain. N. lat. $42^{\circ} 3'$ E. long. $3^{\circ} 4'$.

ISLAS Osas, rocky islets in the Atlantic, near the coast of Spain. N. lat. $42^{\circ} 17'$ W. long. $8^{\circ} 56'$.

ISLAS de Sifarga, a cluster of small islands in the Atlantic, near the coast of Spain. N. lat. $43^{\circ} 23'$ W. long. $8^{\circ} 50'$.

ISLE, L', a town of France, in the department of the Tarn, and chief place of a canton, in the district of Gaillac; five miles S.W. of Gaillac. The place contains 5402, and the canton 6715 inhabitants, on a territory of $82\frac{1}{2}$ kilometres, in 3 communes.—Also, a town of France, in the department

partment of Vaucluse, and chief place of a canton, in the district of Avignon. The place contains 5155, and the canton 11,099 inhabitants, on a territory of $172\frac{1}{2}$ kilometres, in 10 communes.

ISLE-Adam, L', a town of France, in the department of the Seine and Oise, and chief place of a canton, in the district of Pontoise, 6 miles N.N.E. of Pontoise. The place contains 1381, and the canton 11,965 inhabitants, on a territory of $147\frac{1}{2}$ kilometres, in 23 communes.

ISLE-Bouchard, L', a town of France, in the department of the Indre and Loire, and chief place of a canton, in the district of Chinon, surrounded by the Vienne; 9 miles E.S.E. of Chinon. The place contains 1000, and the canton 10,437 inhabitants, on a territory of 240 kilometres, in 20 communes.

ISLE-Boudouin, L', or *Isle-Bouen*, a town of France, in the department of the Vendee, situated on an island of the same name, about 5 miles long, on the coast; 9 miles N.W. of Challons.

ISLE of Cerf, a small island in the English channel, near the coast of France. N. lat. $48^{\circ} 53'$. W. long. $3^{\circ} 25'$.

ISLE-Dieu, L', a town of France, in the department of the Vendee, and chief place of a canton, in the district of Les Sables d'Olonne. The place contains 1049, and the canton 2053 inhabitants, on a territory of 65 kilometres, in 2 communes.

ISLE-d'Ouessant, L', a town of France, in the department of Finisterre, and chief place of a canton, in the district of Brest. The place contains 1645 inhabitants, on a territory of 22 kilometres, in 1 commune.

ISLE-en-Dodan, L', a town of France, in the department of the Upper Garonne, and chief place of a canton, in the district of St. Gaudens; 18 miles N.N.E. of St. Gaudens. The place contains 1100, and the canton 10,832 inhabitants, on a territory of $232\frac{1}{2}$ kilometres, in 24 communes.

ISLE-Jourdain, L', a town of France, in the department of the Gers, and chief place of a canton, in the district of Lombés, situated on the Save; 7 miles E. of Auch. The place contains 4686, and the canton 11,634 inhabitants, on a territory of $262\frac{1}{2}$ kilometres, in 23 communes. N. lat. $43^{\circ} 37'$. E. long. $1^{\circ} 10'$.—Also, a town of France, in the department of the Vienne, and chief place of a canton, in the district of Montmorillon, 24 miles S.E. of Poitiers. The place contains 448, and the canton 7553 inhabitants, on a territory of 375 kilometres, in 11 communes. N. lat. $46^{\circ} 15'$. E. long. $0^{\circ} 25'$.

ISLE-sur-le-Doubs, L', a town of France, in the department of the Doubs, and chief place of a canton, in the district of Baume; 11 miles N.E. of Baume. The place contains 685, and the canton 7048 inhabitants, on a territory of $167\frac{1}{2}$ kilometres, in 24 communes.

ISLE-sur-le-Serein, L', a town of France, in the department of the Yonne, and chief place of a canton, in the district of Avallon. The place contains 478, and the canton 8766 inhabitants, on a territory of 250 kilometres, in 23 communes.

ISLE des Moins, an island of France, in lake Morbihan, with a tower; 5 miles S.S.W. of Vannes.

ISLE Grande, or *La Roche*, an island in the South Pacific ocean, seen by Anthony de la Roche, in 1675. S. lat. 45° .

ISLE Royale, an island on the N.W. side of lake Superior, within the territory of the United States, N.W. of the Ohio; about 100 miles long, and, in many places, about 40 broad. The natives suppose that this and the other islands on the lake are the residence of the Great Spirit.

ISLE Plate, a small island in the English channel, near the coast of France. N. lat. $48^{\circ} 53'$. W. long. $3^{\circ} 24'$.

ISLE of Dogs Canal, is the name of a very wide and deep canal for the passage of ships across the isthmus called the Isle of Dogs, in the river Thames, below London, of which an account has been given under the head of that river, in our article CANAL, and a plan of the same will be found in our plate of Docks.

ISLE of Wight, an insulated tract of land, situated in the English channel, near the coast of Hampshire, from which it is not more than three miles distant at the nearest point, and to which county it belongs in all political and civil matters. The form of the island is that of an irregular lozenge; measuring from the eastern to the western angle nearly twenty-three miles; and about thirteen from the northern to the southern point: its superficies is computed at 105,000 acres. Through the middle, in the longest direction, extends a range of hills, affording excellent pasture for sheep, and commanding views over every part of the isle, with the ocean on the south side, and the coasts of Hampshire on the north. The face of the country is much diversified; hill and dale, the swelling promontory and the lowly glen, appear in quick succession to animate, and give interest to the prospects. The land round the coast is, in some parts, very high, particularly on the south, or back of the island, as it is commonly termed; here the cliffs are very steep, and vast fragments of rock, undermined by the waves, lie scattered along the shore: on the northern side, the ground slopes to the water in easy declivities, excepting towards the Needles, or western point, where the rocks are bare, broken, and precipitous. The height of the cliffs, of which the Needles form the extreme point, is, in some places, six hundred feet above the level of the sea, and when viewed from the distance of about a quarter of a mile, have a grand and almost sublime and stupendous effect. These cliffs are frequented by immense numbers of marine birds; as puffins, razor-bills, willcocks, gulls, cormorants, cornish-choughs, daws, starlings, and wild pigeons; some of which come, at stated times, to lay their eggs and breed; while others remain there all the year. The cliffs are in some places perpendicular; in others, they project and hang over, in a tremendous manner: the several strata form many shelves; which serve as lodgments for the birds, where they sit in thick rows, and discover themselves by their motions and flight, though not individually visible. Here are many caverns and deep chafins, which seem to enter far into the rocks; and in some places, the issuing of springs forms small cascades of rippling water down to the sea. The country people take the birds that harbour in these rocks, by the perilous experiment of descending by ropes, which are fixed to iron crows, driven into the ground: thus suspended, they with sticks beat down the birds as they fly out of their holes. A dozen birds generally yield one pound weight of soft feathers, for which the merchants give eight pence; the carcases are bought by the fishermen at sixpence per dozen, for the purpose of baiting their crab-pots. The rocks, called the Needles, derived their name from a lofty pointed one, resembling a needle in shape, which had been disjoined, with others, from the main land, by the force of the waves: this was 120 feet above the low water mark; but about forty years ago, its base having been excavated by the sea, it fell, and totally disappeared.

All the higher parts of the island are composed of an immense mass of calcareous matter, of a chalky nature, incumbent on schistus, which runs under the whole isle, and appears, at low water mark, on the coast near Mottistoun: this becomes so indurated by exposure to the air, as to make very good whetstones. The lime-stone is burnt for manure;

ISLE OF WIGHT.

and in the pits where it is dug for that purpose, are found numerous echini, sharks' teeth, and ammoniæ. These fossils are particularly abundant in the range of cliffs which forms the southern shore; together with hivalve and turbinated shells of various descriptions: the cornua ammonis are of all sizes, from one inch to eighteen inches in diameter. A stratum of coal discovers itself at the foot of Binbridge cliff, and runs through the southern part of the isle, appearing again at Warden Lodge, in Freshwater parish. On the north side of this stratum lies a vein of white sand, and another of fuller's-earth; and on the south side is a vein of red ochre.

The soils of the island are of various kinds; but the most prevailing is a strong loamy earth, well adapted for agricultural purposes, and extremely fertile. The quantity of grain annually raised here, is computed to amount to seven or eight times as much as sufficient for all the inhabitants. The medium produce of wheat, throughout the island, is about twenty-one bushels per acre; of barley and oats about thirty bushels; and of beans and peas about twenty-eight bushels: potatoes are very productive, though not greatly in esteem, and turnips also yield a rich increase. The meadow lands are extremely fine, and produce from one to three tons of hay per acre. The elevated tracts are mostly appropriated to pasturing sheep; the number annually shorn is about 40,000; the wool is of the finest quality, and in much repute; the breed in general use is the Dorsetshire: about 5000 lambs are sold annually.

The climate is extremely salubrious, and highly favourable to vegetation: its genial qualities, and near approximation, in mildness, to more southern regions, may be instanced by the profusion of myrtles, and by the flourishing state of a vine-plantation at Appuldurcombe. The central parts of the isle are subject to frequent rains; the high range of hills proving a constant source of attraction to the vapours, and, in the winter months, involving all beneath them in gloom and humidity. The general fertility, however, is so little affected, and the vegetation is so abundant, that this island has often been styled the "Garden of England;" an appellation, perhaps, that is partly suggested to the mind by the innumerable plants and flowers which grow every where in wild luxuriance; among them are the *ophrys apifera*, or bee-orchis; the digitalis, or fox-glove; and the crithmum maritimum, or rock-samphire.

The contiguity of the Portsmouth, and other dock-yards for ship-building, has operated to deprive the Isle of Wight of much of its timber; and even Parkhurst, or Carisbrooke forest, which includes about 3000 acres of good land, is almost destitute of trees of any value. The woods of Swainston are of considerable extent; and those of Wooten and Quarr cover a superficies of nearly 1100 acres: the oak and the elm are the most flourishing trees.

Great variety of fish is found on the coast, and in considerable abundance: those of the crustaceous kinds are particularly numerous on the southern shores. The lobster and crab are of uncommon size, and peculiar quality; some of the former are often taken upwards of six pounds weight; the latter so abundant on a particular part of the coast, that a neighbouring village has obtained the name of Crab-Niton from this circumstance. Cockles are in high estimation; the sand-eel is also very plentiful.

The trade of the Isle of Wight is flourishing; the harbour of Cowes is particularly convenient for shipping and unshipping merchandize. The chief imports are coals, timber, deals, iron, wine, hemp, and fruits: the principal exports are wheat, flour, barley, malt, and salt. The chief manufactures are those of starch, hair-powder, and salt; and latterly the making of woollens, facking, &c. has been

carried to some extent in the House of Industry near Newport.

Several chalybeate springs have been discovered in different parts of the island; one of them, at Black Gang, under Chale cliff, is very strong: about half a mile from this, at Pitland, is a spring, impregnated with sulphur; and at Shankin is a spring, the waters of which are slightly tinged with alum. Springs of clear water are very numerous, and in general extremely pure and transparent, from the natural percolation which they undergo through the lime-stone strata.

The principal rivers are the Medina, the Yar, and the Wooten. The Medina, anciently called the Mede, rises near the bottom of St. Catherine's Down, and flowing directly northward, divides the island into two nearly equal parts; gradually widening in its course, it passes to the east of Newport, and in Cowes harbour unites its waters with the ocean. Numerous smaller streams also exist; and various creeks and bays run up from the sea. The two divisions of the island are called the hundreds, or liberties, of East and West Medina, from their relative situations to that river. They contain thirty parishes, in which are comprehended the following boroughs and towns; Brading, Newport, Newtown, and Yarmouth; the three latter of which return six members to parliament.

The ancient history of this island has been a subject of much controversy with topographical writers. Whitaker, in his History of Manchester, contends that it was formerly connected with the main land; and that it is the *Idis* of Diodorus Siculus. At this port, according to the latter writer, the Britons shipped their tin for Gaul; but the original tin staple of Britain was certainly the Cassiterides, or Scilly islands. (See Borlase and Heath's Accounts of these Islands.) During the Anglo-Roman dynasty this island was called *Vesitis*; but it does not appear that the Romans had any station or settlement here; though they had two or three considerable stations on the opposite coast; one at Clausentum, near Southampton, and another at Portchester. Suetonius, the first of the Roman authors, who notices the island under consideration, states, that it was subdued in A.D. 43 by Vespasian. Cerdic, a Saxon chieftain and founder of the kingdom of Wessex, made a second conquest of the isle, and appointed his nephews Sterff and Withgar to govern the inhabitants. In the year 661 it was again subdued by Wulphure, king of Mercia, but this monarch was dispossessed of this tract of land within the space of 15 years. The Danish marauders afterwards visited, and took possession of this island; and preserving a port here, they made frequent descents on the coasts of Hampshire, Dorsetshire, and Sussex. After the Norman conquest, the island was annexed to the crown, and was frequently granted, in trust, to the favourites of different monarchs.

A list of the different noblemen who were governors, or lords of the island, with the conditions on which it was held, are fully narrated in sir Richard Worsley's History of the Isle of Wight. The situation of this island has rendered it liable to invasions in the time of warfare, and particularly when France has been at war with England, and many instances are recorded of descents on this coast. To protect the island, a large and strong fortress, called Carisbrooke castle, was constructed at an early period, and has been preserved as a place of refuge and strength even to the present time. Here a military governor occasionally resides. Other forts were constructed on different parts of the coast; but the great fortifications at Portsmouth, and at other places on the Hampshire coast, serve to guard the island. The southern shore is also naturally protected by rocks. The

Island contains several seats and villas, the principal of which is Appuldercombe park. Sir Richard Worsley's History of the Isle of Wight, 4to. Albin's History, &c. 8vo. Buller's Account of the Island, 12mo. Windham's Picture of the Isle of Wight.

ISLE of *Wight*, a county of Virginia, on the S. side of James's river, W. of Norfolk county, about 40 miles long and 15 broad, containing 5313 free inhabitants, and 4029 slaves. In this county is a mineral spring, to which many persons resort. It is situated about 10 miles from Smithfield, and 12 from Suffolk.

ISLEBEIANUS LAPIS, in *Natural History*, a name given by authors to a kind of blackish slate, very heavy, not very hard, and easily splitting into thin flakes. It is dug near Isleb, in Thuringia, whence it has its name, and is much of the nature of that sort of black slate which we have common in England, lying over the coal strata.

As our slate of this kind contains usually leaves of fern and other plants, this foreign kind contains the impressions of several kinds of fish, so exactly delineated in shape, and with the fins, scales, and all other parts so perfect, that the species are easily known. All these impressions and delineations are, however, so flat and thin, and have taken up so little room in the stone, that they seem rather to have been the skins and exuvie of fish than the whole bodies of them; but this is not wonderful when we consider how easily the bodies, and even the bones of fishes may be dissolved; and that these exuvie are lodged in a substance which contains a vitriolic salt, very capable of effecting such a solution. It is easy to conceive, that this and other such salts, while in a state of solution in water, before the concretion of the matter of this stone into a hard mass, might make that water a menstruum capable of thus dissolving the bodies and bones of fishes, while the outer skin and scales being much tougher, and of a very different nature, might escape the effects of them. It is well known that the fins and scales, and other external parts of fish, are much more capable of bearing maceration in water than the internal substances of them; and it is easy to conceive that these, after having withstood that power in the water, would at length subside down among the muddy matter that was to form some of the strata of this slate: the motion of the water would not fail to expand their skins, though ever so thin, into the true and exact shape of the whole fish; and when thus laid along upon the surface of the new-formed stratum, the next quantity of the same matter that subsided would form another stratum, which falling evenly upon the former, would cover it, and on the following concretion of both, the figure of the fish would be beautifully preserved between two plates or flakes of a fissile stone.

It is very remarkable, that as in these slates of Isleb preserving fishes, the external parts only are preserved, the bones and flesh being wasted: so, on the other hand, in those fissile fishes brought from Syria, the skins and scales are wanting, and the skeletons are principally the part preserved. In some of these the bones are not clean, small parcels of the flesh being found petrified among them; but this flesh is stripped of the skin. The stone in which these Syrian fishes are preserved is also very different from the Isleb slate, being whitish or greyish, and very hard. The stones of this kind found on mount Libanus, where they are very common, have very fine delineations of the star-fish complete. Woodw. Cat. Foss. vol. ii. p. 23, &c.

ISLEBIANS, in *Ecclesiastical History*, a name given to those who adopted the sentiments of a Lutheran divine of Saxony, called John Agricola, a disciple and companion of Luther, a native of Isleb, whence the name; who, inter-

preting literally some of the precepts of St. Paul with regard to the Jewish law, declaimed against the law, and the necessity of good works. See ANTINOMIANS.

ISLEBOROUGH, in *Geography*, a township of America, in Hancock county, Maine, formed by Long island, in the centre of Penobscot-bay; 15 miles long, and from two to three broad: it was incorporated in 1789, contains 483 inhabitants, and is distant 260 miles N.E. by N. from Bolton.

ISLES *de Madame*, islands that lie at the S. end of Sydney, or Cape Breton island, on which they are dependent. The largest of these, with Cape Canso, the E. point of Nova Scotia, forms the entrance of the gut of Canso from the Atlantic ocean.

ISLES of *Don Joseph Galweez*, a large cluster of islands in the South sea, populous, and affording plenty of potatoes, cocoa, bananas, and other fruits. S. lat. 19° 39'. E. long. 179° 38' from Paris.

ISLES, in *Architecture*, the sides or wings of a building.

ISLEWORTH, in *Geography*, a parish in the hundred of the same name, and county of Middlesex, England, is delightfully seated on the banks of the Thames, and has long been the residence of many persons of rank and fortune. The parish consists of about 2370 acres, chiefly appropriated to arable and pasture; but nearly 500 acres are used as gardens and nursery-grounds. At Baberbridge, in this parish, are some large copper and brass mills, rented by the society of the mines-royal. A considerable china manufactory, some extensive calico-grounds, and two large flour-mills are also within this parish. The chief business, or trade of the place, is derived from the gardens, which furnish a vast variety of fruit and vegetables for Covent-garden market. In the year 1794, sir Joseph Banks obtained a correct statement of the population of this parish: and it appeared that the number of houses was 712; of which 43 belonged to gentlemen, 6 to farmers, 26 to publicans; the remainder consisted of shops and cottages. The inhabitants at the same time amounted to 4190. In the year 1800, the houses amounted to 768, and inhabitants to 4346. The principal building in this parish is Sion-house, a spacious seat of the duke of Northumberland. The houses occupy the site of a convent of Bridgetines, founded by king Henry V. The present mansion was enlarged and fitted up by the late duke, who embellished it with several pieces of ancient sculpture, also with twelve Ionic columns, and sixteen pilasters of fine marble. The improvements made in the house, and the elegant façade, adjoining the public road near Brentford, are from designs by the late Mr. Adams. The gardens and pleasure-grounds, contiguous to the Thames, were laid out by the late Mr. Brown. The duke of Marlborough and the earl of Shrewsbury have seats in this parish. Isleworth Park was occupied by the barons' army, headed by Simon de Montford, in the year 1263. On the 4th of August, 1647, general Fairfax appointed his head-quarters at Isleworth, and received the parliamentary commissioners here. Lysons's Environs of London and Middlesex Parishes.

ISLINGTON, a village in Ossulston hundred, Middlesex, England, though formerly a small place, and separated from London by several intervening fields, is now connected to the northern suburbs of the metropolis, and indeed appears to form a part of this vast city. "When it is considered, that Islington is scarcely two miles from the centre of the original London; that it is seated upon the Ermin-street of the Romans, and the spot where they had a military post; also, that it has, from the earliest period of our history, been celebrated for the richness of its pastures, and the excellent

cellent produce of its dairies, there can remain little doubt that these circumstances must have rendered it of considerable importance to the Londoners, as well as the garrison there." This village has been variously spelt in old records and publications; as Ifendune, Ifendon, Ifeldon, Vfeldon, and Eysfeldon: but it appears that the present name has prevailed from the close of the 16th century. The parish of Islington is three miles two furlongs in length, from N.W. to S.E., and two miles one furlong in breadth. It consists of 3032 acres three roods, of which the chief part is appropriated to pasture. Besides the village of Islington, the parish contains the following hamlets: Holloway, Ballspend, Battle-bridge, the City-gardens, Kingland-green, and great part of Newington-green. The population of this parish, in 1800, was returned at 10,212, occupying 1663 houses: in 1793, the latter was only 1200, and the former 6600; whereas, in 1810, the population has increased to 14,000. Previous to the year 1714, the roads and highways were in so bad a state, that in an act of parliament then passed, they are described to be "very ruinous and almost impassable for the space of five months in the year." This furnishes a curious illustration of the amazing improvements made for public accommodation within 100 years: for now foot-passengers are provided with good pavements, or gravel paths, and the public roads are firm, even, and generally clean. They are also furnished with lamps for winter, and watchmen and patrols are employed to protect houses and passengers. From an early period, even before the time of Henry II., Islington has been noted as a place of recreation for the citizens of London; where wrestling-matches, shooting, archery, casting the stone, and other athletic pastimes were pursued. Now the mechanics and lower classes frequent public-houses, which are provided with grounds for skittles and Dutch-pins; places for playing at fives, cricket, and bowls. In this parish, to the north of White Conduit-house, are the traces of an encampment, which several writers have attributed to the Romans, but neither its present state, nor any discoveries that have been made, justify this opinion. Islington contains several commodious, and some handsome houses belonging to London merchants and tradesmen.

For a full and circumstantial history and description of this parish, the reader is referred to "The History, Topography, and Antiquities of Islington," by John Nelson, 4to. 1811.

ISLIP, a post-town of New York, in Suffolk county, Long island, E. of Huntington, containing 958 inhabitants.

ISMADABS, a town of Japan, in the island of Nippon; 125 miles N.W. of Jedo.

ISMAELPOUR, a town of Hindoostan, in Bahar; 38 miles S.W. of Patna.—Also, a town of Bengal; six miles E. of Boglipour.

ISMAIL, or ISMAILOV, a town of European Turkey, in the province of Bessarabia, situated on the N. side of the Danube, about 33 miles from the Black sea. The town measures about a mile toward the land, and half a mile by the side of the Danube, and was fortified by eight bastions. The ramparts are in general 18 feet high, and in some places 25. The moat is from 30 to 40 feet deep, and at an intermediate distance between the polygons named Bender and Brock was a false trench. Near the town was a cavalier of stone-work, capable of holding some thousand men. The side next the water was defended by ramparts and horizontal batteries. This place was taken by storm, December 22, 1790, by the Russians, under general Suwarrow. It is said, that after the Turks had surrendered, the garrison was put to death, and 30,000 men massacred in cold blood; the town

was given up to the unrestrained brutality of the victorious army. The booty found in the place was immense: 144 miles S.W. of Otchakov. N. lat. 45° 23'. E. long. 29° 45'.

ISMANING, a town of Bavaria, which gives name to a county, situated on the Iser; eight miles N. N. E. of Munich.

ISMENIAS, in *Biography*, one of the most celebrated performers on the flute in antiquity, was a native of Thebes; and not less renowned for splendour, extravagance, and caprice, than for his skill in music. Having been taken prisoner by Atheas, king of the Scythians, he performed on the flute before this rude monarch; but though his attendants were charmed so much that they applauded him with rapture, the king laughed at their folly, and said that he preferred the neighing of his horse to the flute of this fine musician.

Ælian tells us, that he was sent ambassador into Persia. Lucian, that he gave three talents, or 581*l.* 5*s.* for a flute at Corinth. Antisthenes, not very partial to music, said he was sure that Ismenias was a worthless fellow, by his playing so well on the flute. Plutarch relates the following story of Ismenias: being sent for to accompany a sacrifice, and having played some time without the appearance of any good omen in the victim, his employer became impatient, and, snatching the flute out of his hand, began playing in a very ridiculous manner himself, for which he was reprimanded by the company; but the happy omen soon appearing, there! said he, to play acceptably to the gods, is their own gift! Ismenias answered with a smile, "While I played, the gods were so delighted, that they deferred the omen, in order to hear me the longer; but they were glad to get rid of your noise upon any terms." Thus we see that neither vanity nor impiety is peculiar to modern musicians.

The same author, in his life of Demetrius, informs us, that Ismenias used to instruct his pupils by examples of excellent and execrable performance; letting them hear, immediately after each other, a good and a bad player on the flute; saying of the first, "this is the way you *should* play;" and of the second, "this is the way you *should not* play." He is recorded by Pliny as a prodigal purchaser of jewels, which he displayed with great ostentation. Being at Cyprus, he found at a jeweller's an engraved emerald of the most exquisite kind, representing the princess Amyona, one of the daughters of Danaus, for which the jeweller asked him five talents, with which demand Ismenias immediately complied. But the jeweller, astonished at his facility, and expecting that an abatement would have been required, offered, conscientiously, to return two of the five talents; but the magnificent musician refused to take them; saying, that it would for ever diminish the value of the gem. Upon this principle it seems as if the purchasers of scarce books were fearful of acquiring them cheap; as their value is often more heightened by their price and margin than contents. And we are convinced that the innumerable crowds who flocked to the Pantheon in 1775, when the Agujari first sung there, were not occasioned by her merit or celebrity as a singer, but by her having 100*l.* a night for her performance; and who knows but that Mrs. Billington's high salaries may have contributed to her attractions, as well as her extraordinary talents?

ISMID, or IS NICKMID, in *Geography*, a town of Asiatic Turkey, situated on a bay of the sea of Marmora; where the Greeks and Armenians have each a church and an archbishop. This is supposed to have been the ancient Nicomedia,

media, the capital of Bithynia; 45 miles E.S.E. of Constantinople. N. lat. $40^{\circ} 39'$. E. long. $29^{\circ} 34'$.

ISMID, a town of Asiatic Turkey, in Caramania; 24 miles E.S.E. of Cogni.

ISMIL, a town of Asiatic Turkey, in Caramania; 30 miles E. of Cogni.

ISMOKIL, a small island on the E. side of the gulf of Bothnia. N. lat. $63^{\circ} 16'$. E. long. $21^{\circ} 20'$.

ISNAGAR, or ISNAJAR, a town of Spain, in the province of Cordova, 10 miles S. of Lucena.

ISNARDI, in *Biography*, according to M. Laborde, "after singing, in his youth, on the stage with success, quitted the theatre, and studied composition and poetry. After which he published sonnets, madrigals, and even short dramas, set to music by himself. His works have been often reprinted." Now if Walther's dates are correct, and he gives authorities for them, Isnardi must have sung with success on the stage before the lyric stage or operas had excellence; but we are unable to find a musician of this name.

ISNARDIA, in *Botany*, was so named by Linnæus, in honour of M. Antoine Danti d'Isnard, member of the Academy of Sciences, in the Memoires of which academy may be found several of his tracts on botany, published between the years 1716 and 1726.—Linn. Gen. 61. Schreb. 84. Willd. Sp. Pl. v. 1. 680. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. ed. 2. v. 1. 266. Juss. 333. Lamarck. Illustr. t. 77.—Class and order, *Tetrandra Monogynia*. Nat. Ord. *Calycanthaceæ*, Linn. *Salicariæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, bell-shaped, permanent, divided into four, slightly spreading segments. *Cer.* none. *Stam.* Filaments four, shorter than the calyx, one placed within each segment of it; anthers simple. *Pist.* Germen inferior; style cylindrical, longer than the stamens; stigma capitate. *Peric.* Capsule square, of four cells, crowned by the calyx. *Seeds* numerous, oblong.

Ess. Ch. Corolla none. Calyx four-cleft. Capsule of four cells, crowned by the calyx.

Obs. Linnæus has observed, in a MS. note to his own copy of the *Genera Plantarum*, that the base of the calyx is furnished with two awl-shaped bractæas adhering closely together.

1. *I. palustris*. Linn. Sp. Pl. 175. (Glaux major palustris, flore herbaceo; Bocc. Mus. 105. t. 84. f. 2.) A native of rivers in France, Russia, Jamaica, North America, &c. It flowers in July, and was first introduced at Kew by Dr. Fothergill, in 1776.—"In general appearance this plant greatly resembles *Peplis Portulaca*. It is creeping and floating. *Flowers* axillary, opposite, sessile, green."—*Leaves* obovate, wedge-shaped at the base, veined and smooth. *Seeds* brown.—Swartz has described a plant in his *Fl. Ind. Occ.* v. 1. 273, under the name of *Ludwigia repens*, which he says differs only from *Isnardia palustris* in being furnished with petals.

ISNARI, PAOLO, of Ferrara, in *Biography*, a disciple of the celebrated musician Manara, maestro di cappella of the Duomo in that city, and a voluminous composer of church music, flourished in the latter end of the sixteenth century. In 1565, he published his "Cantus Hebdomadæ Sanctæ," or Music for Passion Week: in 1568, six-part masses: in 1578, the Vesper psalms in three parts, and three Magnificats in four parts. This last work was reprinted at Milan, 1590.

ISNELLO, in *Geography*, a town of Sicily, in the valley of Demona; 13 miles S. of Cefalu.

ISNIK, a town of Asiatic Turkey, in Natolia, situated on a lake of the same name, called by the ancients Afcianus, that abounds with fish, and that communicates with the sea

of Marmora. The chief article of its trade is silk. It is the see of a Greek archbishop, though it contains scarcely 300 houses. It was anciently called "Niece," and famous for its conneil; 60 miles E. of Constantinople. N. lat. $40^{\circ} 16'$. E. long. $29^{\circ} 50'$.

ISNY, or YSNI, a town of Germany, lately imperial, situated in the Algau, betwixt the counties of Hoheneck and Trauchburg, and the lordship of Uglhof. The magistrates and greatest number of the citizens are Lutherans. It has often suffered by fire; 40 miles S. of Ulm. N. lat. $47^{\circ} 45'$. E. long. $9^{\circ} 58'$.

ISOCHRONAL, or ISOCHRONOUS, is applied to such vibrations of a pendulum, as are performed in equal times.

Of which kind are all the vibrations or swings of the same pendulum, whether the arcs it describes be longer or shorter; for when it describes a shorter arc, it moves so much the slower; and when a long one, proportionably faster. See PENDULUM.

ISOCHRONAL *Line*, is that wherein a heavy body is supposed to descend without any acceleration.

Leibnitz, in the Act. Erud. Lipf. for April 1689, has a discourse on the *linea isochrona*, in which he shews, that a heavy body, with a degree of velocity acquired by its descent from any height, may descend from the same point by an infinite number of isochronal curves, which are all of the same species, differing from one another only in the magnitude of their parameters; such as are all the quadrato-cubical paraboloids, and consequently similar to one another. He shews also how to find a line, in which a heavy body descending, shall recede uniformly from a given point, or approach uniformly to it. See CYCLOID.

ISOCHRONOUS PARCELS, in *Music*. Mr. John Holden labours in his "Essay towards a rational System of Music," to establish it as a principle, that "there is a certain propensity in our mind to be subdividing the large numbers (of equal and equidistant objects) into smaller equal parcels: or, as it may be justly called, compounding the large numbers of several small *factors*, and conceiving the whole by means of its parts," p. 288. "Seven, we conceive, as two threes disjoined, and one in the middle; five becomes two twos disjoined, and one in the middle," p. 289; and again, p. 305, "we readily conceive five by its affinity to four, and seven by its affinity to six," p. 292. "Among the isochronous single vibrations of musical sounds, the mind naturally seeks to constitute isochronous compound parcels."—"The size or magnitude of a musical interval is estimated by the *inequality* of the isochronous parcels of vibrations of its two terms; and in proportion as their isochronous parcels differ more from equality, the included interval becomes greater," p. 327. The above extracts shew the nature and uses to which this author attempts to apply his isochronous parcels of vibrations; in which we can scarcely admit him to have been more successful, than in the application of the GRAVE Harmonics (see that article), or Tartinian sounds, to accounting for the constitution of the musical scale; the incongruous system of intervals to which these fancies lead, will be seen in our article HOLDEN'S *System of Musical Intervals*.

ISOCRATES, in *Biography*, a celebrated Greek rhetorician, was born at Athens about the year 436 B. C. He received a good education, but his father, being ruined by the Peloponnesian war, left him no other inheritance. He had studied under Gorgias, Prodicus, and other great masters of eloquence, but the weakness of his voice, and his want of a proper degree of confidence, prevented him from exercising the talent of speaking in public. He employed himself, therefore, in composing discourses in his closet, and

in

in teaching the art of rhetoric. He was the instructor of Timotheus, son of Conon, whom he afterwards accompanied to several parts of Greece as his secretary. He had numerous scholars at Athens, and was amply remunerated for some of his writings, particularly for a discourse which he addressed to Niccles, king of Cyprus, for which he received a sum equal to between four and five thousand pounds of our money. Though courted by the great, he had an ardent mind in defence of what was just and right. When Theramenes, proscribed by the thirty tyrants, took refuge at the altar, he pleaded in his defence, at the hazard of sharing his fate; and after the death of Socrates, when all his disciples took flight, he dared appear in mourning in the public streets of Athens. He passed a long life in peace and honour, and had reached his ninety-eighth year at the fatal battle of Cheronæa, when, unable to bear the calamity which had befallen his country, he abstained from all sustenance for four days, and expired. It was mentioned, to his praise, that he never, by writing or accusation, injured a single individual. A statue of bronze was raised to his memory by Timotheus, and another by his adopted son Aphareus. The style of Isoerates is pure, sweet, and flowing: he was extremely attentive to the harmony of his periods, and he is reckoned by Cicero as the first who introduced into Greek prose that melody of which it is susceptible. He spent a deal of time in polishing his compositions; his panegyric on Athens is said to have cost him ten years labour. Twenty-one of his discourses remain, which have been distributed into the moral, the deliberative, the panegyric, and the agonistical. Moreri.

ISOETES, in *Botany*, an old name for one of the smaller kinds of *Sedum*, from *ισος*, equal, and *ετος*, the year, as being evergreen. It is for the same reason adopted by Linnæus for the present genus. Linn. It. Sean. 417. t. 419. Gen. 561. Schreb. 755. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 1144. Juss. 17. Lamarck Dict. v. 3. 314. Illustr. t. 862. (Calamaria: Dill. Musc. 540. t. 80. f. 1.) Class and order, *Cryptogamia Filices*. Nat. Ord. *Filices*.

Gen. Ch. Male, *Flowers* solitary, within the base of the inner leaves. *Cal.* a heart-shaped, acute, sessile scale. *Cor.* none. *Stam.* Filament none; anther roundish, of one cell, compressed, convex on one side, concave on the other, standing on the calyx.—Female, *Flowers* solitary, within the base of the outer leaves of the same plant. *Cal.* as in the male. *Cor.* none. *Pist.* Germen ovate, standing on the calyx, within the leaf; style none; stigma . . . *Peric.* Capsule membranous, nearly ovate, concealed within the base of the leaf. *Seeds* numerous, angular, rough.

Eff. Ch. Male within the base of the inner leaves. Anthers solitary, standing on the heart-shaped calyx. Female within the base of the outer leaves. Germen standing on the heart-shaped calyx. Capsule membranous. Seeds many, angular, rough.

1. *I. lacustris*. Common Quillwort.—Linn. Sp. Pl. 1563. Engl. Bot. t. 1084. Bolt. Fil. 74. t. 41. (*Subularia vulgaris erecta*, folio rigidissimo; Raii Syn. 306.)—Fronds awl-shaped, semi-cylindrical, rather spreading. Capsules roundish, of two cells. Seeds granulated all over.—Found under water, about the margins of alpine lakes in various parts of Europe. In those of Wales, Scotland, and Westmoreland, it is abundant, making a sort of coarse evergreen turf, much below the surface. The root is perennial, tuberous, throwing out many long simple fibres. *Leaves* or *fronds* numerous, tufted, simple, awl-shaped, from three to twelve inches high, rather spreading upwards, and often recurved, semi-cylindrical, smooth, divided internally into four longitudinal cells or tubes, with numerous transverse partitions.

The base of each leaf is somewhat dilated, and bordered with a membrane, the *fructification* being situated on the inner side, under the cuticle, that of the inner leaves being male, the outer female. What supports the anther in one flower, the germen in another, may be termed either a calyx or receptacle. The ripe *capsule* is nearly as large as a split pea, brownish, thin, and membranous; we find it divided into two cells by a transverse stricture or partition, notwithstanding what Schreber has mentioned to the contrary, apparently from Oeder. The *seeds* are numerous, small, white, rough all over with minute granulations.

2. *I. fetacea*. Slender Quillwort. Lamarck Dict. v. 3. 314.—Fronds bristle-shaped, nearly round, erect.—Lamarck mentions this as very different from the former in the slenderness and straightness of its *leaves*, which are only about $2\frac{1}{2}$ inches high. The *root* also is entirely fibrous, not tuberous. It was found by the abbé Bonmaterre, growing three or four feet under water, in the lake of St. Andréol, on the mountains of Aubrac, in Gévaudan. We have had no other tidings of this species, but should expect to find it in Britain.

3. *I. unilocularis*. Indian Quillwort.—Roxb. MSS.—Fronds somewhat triangular, erect. Capsules elliptical, of one cell. Seeds granulated on one side, triangular on the other.—Sent from the coast of Coromandel by Dr. Roxburgh. Koenig sent what appears certainly to be the same, in a younger state, to Linnæus by the name of *I. indica*, as found in ponds on a sandy soil, in December. In these latter specimens the *root* of each is a globose tuber. *Fronds* about six, erect, straight, slender, obscurely triangular, with a broad membranous base. *Fructification* too young to be discernible. Dr. Roxburgh's specimens consist of separate *fronds*, larger than the former, as being more advanced, but otherwise exactly similar, the base of each winged with a broad membrane, and lodging an elliptical, slightly compressed, membranous, brownish *capsule*, from above half an inch to near an inch long, of one cell, whose inside is lined with innumerable compressed membranous stalks, each bearing a beautiful white *seed*, convex and granulated below, triangular and smooth above. A spongy body, above the capsule, but, in our specimens, disjointed from it, is lodged in the substance of the leaf, and the same is indicated by the figure of the first species in Engl. Bot. in both male and female flowers, as well as by Linnæus in his *Her Scenicum*. Having never had an opportunity of tracing the progress of the fructification, we are not certain whether this be the part called sometimes calyx, sometimes receptacle, but if so, the capsule is reversed. S.

ISOLA, in *Geography*, a town of Naples, in Calabria Ultra, the see of a bishop, suffragan of St. Severina, from which it is distant S.E. 15 miles. N. lat. $39^{\circ} 4'$. E. long. $17^{\circ} 24'$.—Also, a town of Istria, seated on an isthmus which extends far into the sea, the environs of which are celebrated for wine; 7 miles S. of Capo d'Istria. N. lat. $45^{\circ} 37'$. E. long. $13^{\circ} 40'$.

ISOLA Alta, a town of Italy, in the department of the Mincio; 11 miles N.N.E. of Mantua.

ISOLA de Dovargli, a town of Italy, in the department of the Upper Po, on the Oglio; 12 miles N.E. of Cremona.

ISOLA Pocarizza, a town of Italy, in the department of the Mincio; 18 miles N.E. of Mantua.

ISOLA Grossa. See GROSSA.

ISOLA delle Femine, a small island near the W. coast of Sicily, which was formerly a place of banishment for women.

ISOLA Sacra, a small island at the mouth of the Tiber, near Ostia.

ISOLA delle Scala, a town of the Veronese; 13 miles S. of Verona.

ISOLACCIO,

ISOLACCIO, a town of the island of Corfica; 38 miles N. of Porto Vecchio.

ISOLEPIS, in *Botany*, from $\iota\sigma\omega\varsigma$, *equal* or *uniform*, and $\lambda\epsilon\pi\iota\varsigma$, *a scale*. a genus separated from *Scirpus* by Mr. Brown, in his Prodr. Nov. Holl. v. 1. 221, on account of the want of bristles at the base of the germen or seed, by which alone it is distinguished; a mark, if constant, certainly sufficient in so difficult a tribe. Twelve New Holland species are defined by this author, amongst which are *Scirpus fluitans*, *supinus*, *setaceus*, and *capillaris* of Linnæus; *nodosus* and *prolifer* of Rottbohl; with six never before described.

ISOLETTA, in *Geography*, a town of Italy, in the department of the Mela; 15 miles S. of Brescia.

ISOMERIA, formed of $\iota\sigma\omega\varsigma$, *equal*, and $\mu\epsilon\sigma\eta\varsigma$, *part*, in *Algebra*, a method of freeing an equation from fractions, by reducing all the fractions to one common denominator, and then multiplying each member of the equation by that common denominator.

This amounts to the same with what is otherwise called conversion of equations. See CONVERSION of Equations.

ISONA, in *Geography*, a town of Spain, in Catalonia; 24 miles N. of Balaguer.

ISONEMA, in *Botany*, from $\iota\sigma\omega\varsigma$, *equal*, and $\iota\sigma\eta\mu\alpha$, *a thread* or *filament*. Brown. Mem. of the Wernerian Society, v. 1. 63.—Class and order, *Pentandria Monogynia*. Nat. Ord. *Corticeæ*, Linn. *Apocineeæ*, Brown.

Ess. Ch. Corolla salver-shaped; its mouth and tube without scales; limb in five deep segments. Stamens prominent; filaments inserted into the mouth, simple at the top; anthers arrow-shaped, adhering to the stigma by their middle part. Germens two; style one, thread-shaped; stigma thick, obtuse. No scales beneath the germen. Pouches . . .

The above characters are taken from a shrub gathered on the African coast, near Sierra Leone, by Smeathman, and preserved in the Banksian herbarium. It is hairy, apparently erect, with opposite leaves. Panicle terminal, oppositely divided, corymbose. Leaves of the calyx with a double scerle at their base on the inside. Tube of the corolla half an inch long, cylindrical, bearded in the middle within. Brown.

ISOPERIMETRY, in *Mathematics*, is a branch of the higher geometry, which treats of the properties of isoperimetrical figures, viz. of surfaces contained under equal perimeters; of solids under equal surfaces; curves of equal lengths, &c. Of the foregoing heads, the two first may be considered as containing the elements of the science, which relate principally to the *maxima et minima* of different surfaces and solids, when bounded by figures of equal perimeters, but of a greater or less number of sides, and posited in a different order. The other part, which relates to the *maxima et minima* of curves, treats of problems of another kind, and of the most difficult nature which have engaged the attention, and exercised the talents, of many of the greatest mathematicians of modern times; as Newton, Leibnitz, the Bernouillis, Euler, Lagrange, &c. and gave rise to many warm and even rancorous disputes, particularly between the brothers John and James Bernouilli, which we shall mention more particularly in the subsequent part of this article, after having given a slight historical sketch and view of the more elementary parts of this interesting branch of mathematical inquiry.

The problems in which it is required to find, among figures of the same or different kinds, those which, within equal perimeters, shall comprehend the greatest surfaces, and those solids which, under equal surfaces, shall contain the greatest volume, had long engaged the attention of

mathematicians before the invention of fluxions, and different methods had been devised for the solution of them by Des Cartes, Fermat, Sluze, Hudde, and others; but these were all supplanted by the simplicity and generality of the new analysis; after which time the elements of the science seem to have been lost sight of by mathematicians, who were all engaged in the solution of the higher order of isoperimetrical problems.

Simpson was the first who condescended to treat of the more elementary parts of this science, by giving, in his *Geometry*, a very interesting chapter on the maxima and minima of geometrical quantities, and some of the simplest problems concerning isoperimeters. The next who treated the subject in an elementary manner was Simon L'Huilier of Geneva, who, in 1782, published his treatise "*De Relatione mutua Capacitatis et Terminorum Figurarum*," &c. His principal object in the composition of that work was to supply the deficiency in this respect, which he found in most of the elementary courses, and to determine, with regard to both the most usual surfaces and solids, those which possess the minimum of contour with the same capacity; and reciprocally, the maximum of capacity with the same boundary. Legendre has also considered the same subject, in his "*Elements de Géométrie*;" Dr. Hutton, in his "*Course of Mathematics*;" and Dr. Horsley, in the *Philosophical Transactions*, vol. lxxv. for 1775.

Elements of Isoperimetry.

PROPOSITION I.—Of all triangles that can be contained under any two given right lines, and any other line joining their extremities, that will be the greatest that has the two given lines perpendicular to each other. *Fig. 1. Isoperimetry. Plate IX. Geometry.*

Let AB and BD be the given lines, then will the triangle ABD, in which they are perpendicular to each other, be the greatest: for let BC = BD, and the angle ABC either greater or less than the right angle ABD; and let also CF be drawn parallel to AB, and meeting BD in F; and join AF, AC, AC'.

Then the $\angle BFC$ being a right angle, it is evident that BC, or BD, is greater than BF, and therefore the triangle ABD, being greater than the triangle ABE, is also greater than its equal ABC. Q. E. D.

The same may be otherwise demonstrated, thus:—Assume either of the two given sides for the base of the triangle; then the area being directly as the perpendicular let fall upon that side from the opposite extremity of the other given side, the surface will be the greatest when that perpendicular is the greatest, that is, when the other side is not inclined to that perpendicular, but coincides with it; hence the area is a maximum when the two given sides are perpendicular to each other. Q. E. D.

PROP. II.

Of all triangles of the same base, and whose vertices fall in a right line given in position, the one whose perimeter is a minimum, is that whose sides make equal angles with the given line. *Fig. 2.*

Let AB be the common base of a series of triangles ABC, ABC', whose vertices C, C', fall in the right line LM, given in position; then is the triangle of least perimeter, that whose sides AC, BC, make equal angles with the line LM.

For, let BL be drawn from B perpendicular to LM, and produce it to D, till DM = BM, and join DA; and from the point C, where this line intersects LM,

draw CB ; and also from any other points C' , C'' , assumed in LM , draw $C'A$, $C'B$, $C'D$; then it is obvious, that $C'D$, CD , $C''D$, are respectively equal to $C'B$, CB , $C''B$, and therefore $AC' + C'D = AC' + C'B$, and $AC + CB = AC + CD = AD$; and consequently, since two sides of a triangle are greater than the third side, we have $AC' + C'D > AD$, or $(AC' + C'B) > (AC + CB)$; and the same is true of any other point C' in the line LM ; therefore $AC + CB$ is less than any other two lines that can be drawn from A , B , to meet in the line LM , and consequently $AB + AC + CB$ is the triangle, having the minimum perimeter, and it has its sides meeting LM at equal angles, as is evident, *Q. E. D.*

Cor.—Of all lines drawn from two given points, to meet in a line given in position, the sum of those two shall be the least, that make equal angles with the given line.

PROP. III.

Of all triangles having the same base, and the sum of the other two sides the same, the isosceles is the greatest. *Fig. 3.*

Let ACB be an isosceles triangle on the base AB , and ADB a triangle on the same base, having its two sides $AD + DB = AC + CB$; then will ABC be the greatest triangle.

First draw CH perpendicular to AB , and DEF parallel to AB , intersecting CH (produced if necessary) in the point E ; likewise let AE and BE be drawn.

Now it is evident, that the angles AEF and BED are equal, and consequently by Prop. II. $AE + EB$ is less than $AD + DB$, or less than the equal sum $AC + CB$; therefore the point E , and consequently the whole triangle AEB , must fall within the triangle ACB , and therefore the triangle AEB , or its equal ADB , is less than ACB . *Q. E. D.*

PROP. IV.

Of all triangles standing on the same base, and having the same vertical angle, the isosceles one is the greatest. *Fig. 4.*

For since all triangles whose bases and vertical angles are equal have their vertices in the same circular segment, it is obvious, that the isosceles triangle ABC is that which has the greatest perpendicular; and since triangles whose bases are given, are as their perpendiculars, it follows that the isosceles triangle, which has the greatest perpendicular, will also have the greatest surface. *Q. E. D.*

PROP. V.

Of all right lines that can be drawn through a given point, between two right lines given in position, but not parallel, that which is bisected by the given point forms, with the other two lines, the least triangle. *Fig. 5.*

Let AB , BC be any two lines given in position, and D the given point; then I say that the line EDF , which is bisected in the point D , makes with the two given lines AB , BC the least triangle. For if EI be drawn parallel to BC , meeting GH in I , the equi-angular triangles DFH , and DEI , will be equal, because $ED = FD$; and DFH will therefore be greater, or less, than DEG , according as BG is less, or greater, than BE ; in the latter case, let the space $DEBH$ be added to both, so shall FEB be less than GHB ; and if in the former case, $DGBF$ be added, then will HGB be greater than FEB ; and consequently FEB , in this case also, less than HGB . *Q. E. D.*

Cor.—If DM and DN be drawn parallel to BC and BA , the two equal triangles DEM and DFN , taken together (since $EM = DN = MB$), will be equal to the parallelogram $DMBN$; and therefore this parallelogram is equal to half the triangle FEB , but less than half the triangle BGH ; whence it follows, that a parallelogram is always less than half the triangle in which it is inscribed, except when the base of the one is half the base of the other, in which case the parallelogram is exactly equal to half the triangle, which is the maximum parallelogram that can be inscribed in any triangle.

Scholium.—From the preceding corollary it might be demonstrated, that the least triangle that can possibly be described about, and the greatest parallelogram that can be inscribed within, any curve, concave to its axis, will be when the subtangent is equal to half the base of the triangle, or to the whole base of the parallelogram.

PROP. VI.

Of all right-lined figures, contained under the same number of sides, and inscribed in the same circle, that is the greatest whose sides are all equal. *Fig. 6.*

For, if possible, let some polygon, $ABCEF$, whose sides CE , FE , are unequal, be the greatest; and let CDF be an isosceles triangle, described in the same segment with CEF which, being greater than CEF by Prop. IV. the whole polygon $ABCDF$ is greater than the polygon $ABCEF$, whereas we have supposed the latter to be the greatest, which is absurd; therefore the polygon which has all its sides equal is the greatest. *Q. E. D.*

Cor. 1.—It follows, with reference to the same figure, that of all right-lined figures, contained under the same perimeter, and of the same number of sides, the greatest is that which has all its sides equal.

For if $ABCEF$ be supposed the greatest, in which the sides CE and EF are unequal, then the triangle CEF would be greater than the triangle CDF , the sum of the sides in both cases being equal; but, since CDF is an isosceles triangle, it is greater than any other on the same base, and of equal perimeter, Prop. III.; therefore DC and DF must be equal, and the same may be demonstrated of any other two unequal sides.

Cor. 2.—Hence again it follows, that of all right-lined figures, contained under the same number of sides, and of equal perimeters, the greatest is that which may be inscribed in a circle: the figure being a regular polygon by the foregoing corollary.

PROP. VII.

Of all rectilinear figures, in which all the sides except one are given, the greatest is that which may be inscribed in a semicircle, whose diameter is that unknown side. *Fig. 7.*

For conceive $ABCDEF$ to be a rectilinear figure, that is not inscribable in a semicircle, and draw any two lines AD , FD , from the extremities of the side AF , to any angle of the figure; then it is obvious, that the whole figure will be the greatest when the triangle ADF is the greatest, but this will be Prop. I. when ADF is a right angle, and in the same manner we find that ACF is a right angle, and so on; and consequently when the figure is inscribed in a semicircle, of which the unknown side is the diameter, its surface will be the greatest. *Q. E. D.*

PROP. VIII.

Of all figures, made with sides given in number and magnitude,

itude, that which may be inscribed in a circle is the greatest. *Figs. 8. and 9.*

Let $ABCDE$, &c., and $abcde$, &c. be two polygons, of which the sides of the one are respectively equal to the sides of the other; that is, $AB = ab$, $BC = bc$, $CD = cd$, &c., the first of which is inscribed in a circle, but the other not inscribable; then I say, that the polygon $ABCDE$, &c. that is inscribed in a circle, is greater than the polygon $abcde$, &c. which is not so.

For draw the diameter EP ; join AP , BP ; and upon $ab = AB$ make the triangle apb equal in all respects to the triangle APB , and join ep . Then of the two figures $edcbp$, and $pagfe$, one at least is not by (hyp.) inscribable in a semicircle, of which ep is the diameter, consequently one at least of these two figures is smaller than the corresponding part of the figure $ABCDE$, &c.; and therefore the whole of this last figure $ABCDEFGP$ is greater than the other whole figure $abcdefg$; and if from each of these there be taken away the equal triangles APB , and apb , there will remain the polygon $ABCDE$, &c. greater than the polygon $abcde$, &c. *Q. E. D.*

Cor.—The magnitude of the greatest polygon which can be contained under any number of unequal sides, does not at all depend upon the order in which those lines are connected with each other. For since in all cases it must be inscribable in a circle, it may always be divided into the same number of isosceles triangles, which will be respectively equal in all cases.

PROP. IX.

Of all polygons circumscribed about the same or equal circles, that has the greatest surface which has the greatest perimeter. For conceive radii to be drawn from the centre of the circle to each of the points of contact, then it is obvious that the area of the polygon will be equal to the rectangle of the radius into half the perimeter of the figure; therefore the area being as the perimeter, it follows that the polygon, having the greatest perimeter, will have the greatest area. *Q. E. D.*

Cor. 1.—Hence the area of any polygon circumscribed about a circle, is to the area of the circle, as the perimeter of the former is to the circumference of the latter. Also, the area of different polygons circumscribed about the same, or equal circles, are to each other as their perimeters.

Cor. 2.—If a circle and a polygon, circumscribable about another circle, are isoperimeters, they will be to each other as the radii of the circles.

PROP. X.

The circle is greater than any rectilinear figure of the same perimeter; and it has a perimeter less than any rectilinear figure of equal surface. *Figs. 10. and 11.*

Let the circle PQ , and the polygon $ABCDEF$, be isoperimeters; then I say that the circle is greater than the polygon.

For first, whatever may be the number of sides of the polygon, it will be the greatest under the same perimeter when the polygon is regular, *Cor. 1. Prop. VI.*; and consequently there may be a circle inscribed within it, the area of which circle will be evidently less than the area of the polygon, and therefore by *Cor. 1. of the preceding proposition*, the circumference of this circle will be less than the perimeter of the polygon, or less than that of the circle PQ ; and consequently, also, the radius of the former will be less than the radius of the latter. But by *Cor. 2. Prop. IX.* the area of the circle PQ , is to the area of the polygon, as the radius of the circle PQ is to the radius of the circle ab ; and there-

fore the area of the former is greater than the area of the latter; that is, a circle is greater than any right-lined figure of equal perimeter.

Again, conversely, if the areas are equal, the circumference of the circles is less than the perimeters of the polygon.

For conceive a circle to be made whose circumference is equal to the perimeter of the polygon, then will this circle be greater than the polygon by what is proved above, and consequently greater than that circle which is equal to the polygon; and therefore its circumference will also be greater, that is, the perimeter of the polygon will always be greater than the circumference of a circle of equal surface. *Q. E. D.*

PROP. XI.

The greatest rectangle, that can be contained under the two parts of a line, any how divided, will be when the line is bisected.

Let AB be a line that is bisected in C , then will $AC \times CB$ be greater than $AD \times DB$, D being any other point in the line AB .

For $AC \times CB = AC^2$, but $AD \times DB = (AC - DC) \times (AC + DC) = AC^2 - DC^2$; consequently the first rectangle is the greatest. *Q. E. D.*

PROP. XII.

The greatest solid that can be contained, under the three parts of a given line, any way taken, will be that in which the three parts are equal to each other.

For supposing the point C fixed, then the rectangle of the two parts $AD \times DC$, will be the greatest when $AD = DC$ (by *Prop. XI.*). In the same way, if any other point be supposed fixed, as D , then will the rectangle $DC \times CB$ be the greatest when $DC = CB$, and consequently the solid $AD \times DC \times CB$ will be the greatest when these parts are all equal. *Q. E. D.*

Cor.—Hence of all parallelopipeds having the sum of their dimensions the same, the cube is that which has the greatest capacity.

PROP. XIII.

A line being divided into two parts, the solid that is contained under one of those parts, and the square of the other, will be the greatest when the latter part is double the former.

Let AB be divided into two parts in the point C , making $AC = 2CB$, then will $AC \times CB$ be greater than when C is taken in any other part of the line AB .

For in whatever part of the line AB the point C be taken, the point A may be bisected in D , and then we shall have $AC \times CB =$ four times $AD \times DC \times CB$, but this last is the greatest when $AD = DC = CB$ (*Prop. XII.*) therefore, the former is the greatest when $AC = 2CB$. *Q. E. D.*

PROP. XIV.

Of all prisms of equal altitudes, and whose bases are also equal, and like, the right prism has the smallest surface.

For the area of each face of the prism is proportional to its height; and therefore the area of each face is the smallest when its height is the smallest, that is, when it is equal to the altitude of the prism, which is evidently when the prism is a right one. *Q. E. D.*

Cor.—And hence, conversely, of all prisms whose bases are equal and like, and whose lateral surface is the same, the right prism has the greatest altitude and capacity.

ISOPERIMETRY.

PROP. XV.

A cylinder has a less surface than any prism of equal base and altitude.

For since the bases and altitudes are equal by hypothesis, the surfaces will be greater or less, as the lateral surfaces are greater or less; but these will be as the perimeters of the solid bases, of which that of the cylinder will be the least, being a circle (by Prop. X.), and consequently the cylinder is that which has the least surface.

Cor. 1.—And again conversely, of all solids on equal bases, and whose surfaces are also equal, the cylinder is that which has the greatest capacity.

Cor. 2.—In the same manner (by Prop. VI. Cor. 1.) it may be demonstrated, that of all right prisms of the same altitude, and whose bases are equal, and of the same number of sides; that has the least surface whose base is a regular figure, and therefore when the prism is a parallelepiped the base is a square.

Cor. 3.—And again, of all right prisms, whose altitudes and surfaces are equal, and whose bases have a given number of sides, that which has a regular figure for its base is the greatest; and therefore when the prism is a parallelepiped the base is a square.

PROP. XVI.

Of all right parallelepipeds, given in magnitude, that which has the smallest surface has all its faces equal, or is a cube: and reciprocally of all parallelepipeds of equal surface, the greatest is a cube.

For by the foregoing corollaries, the right parallelepiped, having the smallest surface, with the same capacity, or the greatest capacity with the same surface has a square for its base: but any face whatever may be taken for the base: therefore in the parallelepiped, whose surface is the smallest with the same capacity, or whose capacity is the greatest with the same surface, has necessarily every two of its opposite faces squares, and consequently it is a cube. Q. E. D.

PROP. XVII.

Of all cylinders of the same capacity, that has the least surface whose altitude is equal to the diameter of its base. *Fig. 12. and 13.*

Let $ABCD$, and $abcd$, be two cylinders of equal capacity, and of which the first, $ABCD$, has its altitude equal to the diameter of its base, and the other any cylinder whose dimensions are not the same with the first, then I say the cylinder $ABCD$ has the least surface.

For conceive each of these cylinders to be circumscribed by a square prism, then will the capacities of these prisms be also equal; and their surfaces will be to each other as the surfaces of the cylinders that they circumscribe, as is evident from (Cor. 1. Prop. IX.); and therefore reciprocally, the surfaces of the cylinders will be to each other as the surfaces of the prisms: but since these prisms have equal capacities, that which circumscribes the cylinder $ABCD$ has the least surface, because it is a cube (Prop. XVI.); and consequently, the surface of that cylinder is the least also. Q. E. D.

Cor.—In a similar manner it is demonstrated, that of all cylinders of the same surface, that has the greatest solidity whose altitude is equal to the diameter of its base.

Isoperimetrical Problems.—We have before observed, that the theorems relating to the surfaces and solidities of bodies, of equal perimeters, might be considered as forming the elements of isoperimetry, and which, as we have seen, are de-

monstrable from the simple elements of geometry; while those relating to the *maxima et minima* of curves are of the highest order of problems; which have called into action the talents, and excited the passions, of some of the ablest geometers of modern times, having led to a dispute, which, for want of impartial and competent judges, remained undecided for many years, and which has since been termed “the war of problems,” on account of the great interest it excited, and the determined and able manner in which each party supported its opinion, and contended that of its opponent; and as this dispute cannot but be considered as one of the most memorable events in the history of the modern analysis, we shall present the reader with an abstract of it, so far as it relates to isoperimetry, referring him for further information to the “*Histoire des Mathematiques*,” by Montucla, vol. iii. p. 322, and to Bossut’s “*History of Mathematics*,” p. 331; and also to an interesting little treatise on this subject, lately published by Mr. Woodhouse of Caius college, Cambridge.

The first problem which can be said to relate to this class, was proposed by Newton in his “*Principia*,” which was that of the solid of least resistance. But the subject and doctrine did not become a matter of discussion and controversy, till John Bernoulli required of mathematicians the determination of the curve of quickest descent, in a paper published in the *Leipsc acts* for June 1696, under the following form:

PROBLEMA NOVUM

ad cuius solutionem mathematici invitantur.

“*Datis in plano verticali duobus punctis A et B, assignare mobili M, viam A M B, per quam gravitate sua descendens, et moveri incipiens a puncto A, brevissimo tempore perveniat ad alterum punctum B.*” *Fig. 14.*

At the first view of this problem, it would be imagined, that a right line, as it is the shortest path from one point to another, must likewise be the line of swiftest descent: but the attentive geometer will not hastily assert this, when he considers that in a concave curve described from one point to another, the moving body descends at first in a direction more approaching to a perpendicular, and consequently acquires a greater velocity than down an inclined plane; which greater velocity is to be set against the length of the path, which may cause the body to arrive at the point B sooner through the curve than down the plane. Metaphysics alone, therefore, cannot solve the question; in fact it requires the utmost accuracy of mathematical investigation and calculation, the result of which shews that the path required is a cycloid reversed, as we shall see in what follows, being at that time a new and remarkable property of this curve, which the researches of Huygens and Pascal had previously rendered so celebrated. See CYCLOID.

According to Bossut, Leibnitz resolved this problem the same day on which he received it, but that he and John Bernoulli agreed to keep back their solutions; but the fact of Leibnitz having obtained a correct solution seems to be very doubtful; at all events, at the expiration of six months, the time allowed, no solution was published, and the time was accordingly enlarged to one year, during which period the solutions of James Bernoulli, Newton, and the marquis de l’Hôpital appeared; Bernoulli’s and Newton’s were both given in the *Acta. Erud. Lips.* for May 1697, but the latter without a name, the real author of which, however, mathematicians had little trouble in divining, for as John Bernoulli observed on this occasion, “*ex ungue leonem.*”

James Bernoulli, in the course of his investigations, had ascended to problems on isoperimetrical figures requiring still more profound speculations, and, after having resolved them

them, he proposed to mathematicians in general, at the conclusion of his solution of his brother's problem.

The rivalry in glory that had long divided the Bernouillis, was fully displayed on this occasion. At first it was a little moderated by their habits of seeing each other, at least occasionally, and by the intervention of their common friends; but John having been appointed professor of mathematics at Groningen in 1695, all private intercourse between them soon ceased, and they no longer corresponded except through the medium of periodical publications, for the purpose of proposing to each other the most difficult problems; and here it was that James Bernouilli, desirous of avenging himself of the ingratitude of his brother, to whom he had been preceptor, challenged him by name to answer the following problem.

Of all isoperimetrical curves described on the same common base BN , to find BFN , such that another curve, BZN , shall contain the greatest space; the ordinate of which, PZ , is in any multiply or submultiply ratio of the ordinate PF , or of the arc BF . Or, as we should say now, the ordinate of which, PZ , is any function of PF , or of the arc BF . *Fig. 15.*

To this leading proposition, he added another more analogous to that of the line of swiftest descent, which was, to find among all the cycloids, which a heavy body may describe from a point to a line given in position, that cycloid which is described in the least possible time, which propositions he concluded in nearly the following words. "A person for whom I pledge myself (*Prodit Non Nemo*, pro qui caveo) engages to give my brother, independently of the praise he will deserve, a prize of 50 florins, on condition that within three months, he engages to resolve these problems, and within a year publishes legitimate solutions of them." Adding, "if at the expiration of this time, no one shall have resolved them, I will make public my solutions."

These propositions, as we have before observed, were sent with the solution of the *brachystochrone* (a term by which John Bernouilli's problem was designated); and as soon as he had noticed the solutions to this, in doing which he bestowed great praise on that of Newton and de l'Hôpital, and some slight censure on his brother's, he undertook the solution of James's problems above-mentioned, and imagining that his theory of the line of swiftest descent was alone sufficient to solve them, the following expressions of ingenuous vanity escaped him. "Difficult," says he, "as these problems appear, I did not fail to apply to them the instant they came to my hands, and hear with what success: instead of three months allowed me to sound their depth, and the remainder of the year to find their solutions, I have employed only three minutes to examine, enter upon, and dive to the bottom of this mystery." These high sounding phrases were accompanied with the construction he gave of the problems, and the consequent demand of the prize, which he said he should give to the poor, as it cost him so little trouble to gain it. But the business was by no means so far advanced as he supposed, as his solution only answered for particular cases, in consequence of his having made only two elements of the curve enter therein, while the general solution required three; and he therefore thus laid himself open to the keen reproaches of his brother, who soon perceived in what respect the solution was defective, and being at the same time perfectly sure of his own, he published an advertisement in 1698, in which he asserted that his brother's method was defective. He likewise allowed geometers time to find the solution, and if no one gave it, he pledged himself for three

things; 1st. To divine with precision the analysis of his brother: 2dly. Whatever it might be, to point out fallacies in it: and, 3dly. To give the true solution of the problem in all its parts. Adding, at the same time, that if any person was sufficiently interested in the progress of science to venture a wager upon these articles, that he would engage to forfeit an equal sum if he failed in the first; double the sum if he did not succeed in the second; and triple the sum if he did not accomplish the third.

The singularity of this advertisement, and the reputation of the writer as a geometer, a little staggered John Bernouilli's confidence in his method. He revised his solution, allowed that he had made a trifling mistake, which he ascribed to too great precipitancy, and sent a new result, but without assuming a more modest tone, and again demanded the prize.

To these pretensions, James Bernouilli laconically answered, "I beg my brother to revise his last solution anew, to examine it carefully in every point, and then to let us know whether it be all right; as he must be aware, that no attention can be paid to his excuses of precipitancy after I have published my solution." But John Bernouilli, who was not aware of the radical defect of the method that he employed, felt an entire confidence in his last result, and said in reply there was no necessity to revise what he had done, and that his time would be much better spent in making new discoveries. To this confident assertion James ironically answered, "I never believed that my brother was master of the true solution of the isoperimetrical problem, and I doubt it now more than ever, from the difficulty he makes of the revision of his solution; if it cost him but three minutes, as he asserts, 'to examine, enter upon, and dive to the bottom of the whole mystery,' surely the revival could not require more: but suppose he spent double that time, how many new discoveries would he be robbed of by the six minutes thus employed."

To this John again replied, and the matter still remained undecided; till, in 1700, James Bernouilli printed at Basil a letter addressed to his brother, in which he invited him with great moderation to publish his method, and concluded by giving the formulæ of the problem, but without their demonstrations. John soon perceived how far he differed from his brother, but not discovering the principle of the true solution, nor the defect of his own method, he at length gave it in a paper which was sent under a seal to the Academy of Sciences at Paris, in the month of February 1701, on condition that it should not be opened without his consent, and after his brother had published his analysis.

As soon as James Bernouilli was informed of this, he had no longer any reason to keep his solution a secret: he accordingly made it public, and maintained it by way of a thesis at Basil, in March 1701, with a dedication to the four illustrious mathematicians, de l'Hôpital, Leibnitz, Newton, and Fatio de Duillier. He likewise printed it separately under the following title: "*Analysis magni problematæ isoperimetricæ.*" This was considered as a prodigy of sagacity and invention; and indeed, if the time be considered, it will not be too much to assert that a more difficult problem was never resolved. The marquis de l'Hôpital wrote to Leibnitz, that he had read it with avidity, and that he had found it very direct and accurate, which testimony Leibnitz transmitted to John Bernouilli himself, though he was much prejudiced in his favour, having himself before examined and approved of John Bernouilli's solution; the latter having submitted it to him for his opinion.

After this publication John Bernouilli maintained a perfect silence,

silence, neither publishing his own solution, nor criticising that of his brother's. At length, in 1755, James Bernouilli died, and a short time after John Bernouilli published his solution in the *Memoires of the academy* for 1706. This, however, possessed the same radical defect that has been before stated, namely, that the author had considered only two elements of the curve, instead of which it is requisite to have three enter, or to employ an equivalent condition. In problems of the same kind as that of the line of swiftest descent, where it is simply required to fulfil the conditions of the maximum or minimum, the applying of this condition to two elements is sufficient to find the fluxional equation of the curve; but when, beside the maximum or minimum, the curve must possess a farther property of being isoperimetrical to another, this new condition requires that a third element of the curve shall have a certain inclination with respect to the other two; and every determination, founded simply on the first consideration, will give false results; except in those cases where a curve cannot satisfy one of the two conditions, without at the same time fulfilling the other; and of this John Bernouilli was at length so convinced, that he made it the basis of a new solution, more than 13 years after his brother's death, confessing himself deceived in his first. "J'ai donner ici," says he, "pour reparer cette inadvertence une nouvelle manière de résoudre," &c. This was a tardy avowal, but it would still have done him honour, had he at the same time acknowledged that his new solution was in substance the same as his brother's; but given in a form which considerably abridged the calculation; instead of which, he even in this seeks every occasion to asperse his brother's method, and this after a lapse of so many years, when, as Mr. Woodhouse observes, "the recollection of his brother's kindness, or zeal for a brother's fame, ought to have assuaged and laid to sleep all angry passions;" but with regard to the solution itself, it must be acknowledged, considering the state of analytical science at that time, to possess very distinguishing marks of a great master, and fairly merits the eulogium which the author himself has bestowed upon it; that of being equally exempt from the tediousness of his brother's, and the obscurity of Taylor's calculation, alluding here to the solution of the celebrated Dr. Brook Taylor, which appeared, in 1715, in his "*Methodus Incrementorum*." At the period at which we have now arrived, James Bernouilli had been dead several years, and the above paper was the last that John Bernouilli wrote on the subject of isoperimetry, but the theory was pursued by many other eminent mathematicians, and introduced into several of their works. Simpson, in his *Traacts*, has a chapter, entitled "An Investigation of a General Rule for the Resolution of Isoperimetrical Problems of all Orders." He has also given the solution of several isoperimetrical problems, in his "*Doctrine of Fluxions*." Maclaurin has likewise a chapter on the same subject in his "*Treatise of Fluxions*." To these may also be added Emerson, Le Seur, Bossut, and Lacroix; each of which authors has introduced this doctrine into their respective works; but the two writers who have most contributed in bringing to perfection the theory of isoperimetry, are Euler and Lagrange, the former having, beside several memoirs in the *Acta Petro*, a tract on this subject, entitled "*Methodus inveniendi Lineas Curvas Proprietate Maximi Minime gaudentes*," which, with a very few exceptions, is what it was intended to be, a complete treatise, containing essentially all the requisite methods of solutions, with great variety and abundance of examples and illustrations: there were still, however, some defects in this work, for want of a better algorithm, or more compendious process of establishing the

theorems; and certain supplemental formulæ; which defects have been finally removed by Lagrange, in his admirable and refined "*Calculus of Variations*;" and a very interesting treatise on the same subject has lately been published by Mr. Woodhouse, in which are combined the history and progress of the science, with such observations and remarks, as seem most calculated to render it instructive and familiar to the English student.

Having thus given a brief sketch of the successive improvements that have been made in the theory of isoperimetry, from the time of its first introduction by John Bernouilli, to its completion by Lagrange; we shall conclude this article with the solution of a few problems which will illustrate many of the remarks that have been made in the foregoing pages, referring the reader who wishes for farther information to the works above quoted.

The researches of Euler and Lagrange have rendered the solution of isoperimetrical problems extremely simple, but the investigations by which they arrived at their formulæ of solution are very profound, long, and embarrassing, which nothing less than the genius of these celebrated men would have been able to have reduced to that simple form at which they at length arrived, an investigation of which, at least of Lagrange's, will be given under the article *VARIATION*. In this place we shall barely state the results, and shew their application to the solution of a few problems of this kind.

Let V represent any function of the variable quantities x and y , and let there be assumed

$$\dot{V} = M\dot{x} + N\dot{y} + P\dot{p} + Q\dot{q}, \text{ \&c. [A]}$$

$$\text{where } p = \frac{\dot{y}}{\dot{x}}, q = \frac{\ddot{y}}{\dot{x}^2}, r = \frac{\ddot{q}}{\dot{x}}, \text{ \&c.}$$

Then the solution of all isoperimetrical problems, into which no integral quantity enters, are solvable by the following general formula,

$$N - \frac{\dot{P}}{x} + \frac{\ddot{Q}}{x^2} - \frac{\ddot{r}}{x^3} + \text{\&c.} = 0 \text{ [B]}$$

which however, for the sake of a more ready application, may be divided into the following cases.

Case 1.—If M , Q , and all the co-efficients except N and P , in the above value of \dot{V} , be equal to zero, then we have

$$\dot{V} = N\dot{y} + P\dot{p}; \text{ and since generally } N - \frac{\dot{P}}{x} + \frac{\ddot{Q}}{x^2} - \text{\&c.} = 0, \text{ it becomes in this case } N - \frac{\dot{P}}{x} = 0; \text{ \&c.} \text{ e quently,}$$

$$N\dot{y} - \frac{\dot{y}}{x}\dot{P} = 0; \text{ or, since } \frac{\dot{y}}{x} = p, \text{ it reduces to } N\dot{y} - p\dot{P} = 0; \text{ whence } N\dot{y} = p\dot{P}; \text{ and substituting this last value of } N\dot{y}, \text{ we have } \dot{V} = p\dot{P} + \dot{P}p; \text{ and taking the fluents } V = Pp + c, c \text{ being the correction.}$$

If M be not equal to 0, we must add the fluent of $M\dot{x}$; then $V = \int M\dot{x} + Pp + c$.

Case 2.—Let $M = 0$, $N = 0$, and all the co-efficients after Q , then $\dot{V} = P\dot{p} + Q\dot{q}$, and the general formula in this case becomes

$$- \frac{\dot{P}}{x} + \frac{\ddot{Q}}{x^2} = 0;$$

$$\text{whence } \dot{P} = \frac{\ddot{Q}}{x}, \text{ and the fluents give } P = \frac{\dot{Q}}{x} + c; \text{ multiply}$$

multiply this by \dot{p} , and since $\frac{\dot{p}}{\dot{x}} = q$, we thus obtain

$$P \dot{p} = q \dot{Q} + c \dot{p};$$

and now substituting this value of $P \dot{p}$, in the general expression for \dot{V} , it becomes

$$\dot{V} = q \dot{Q} + Q \dot{q} + c \dot{p}$$

and by taking the fluents on both sides

$$V = Q q + c p + c';$$

c and c' being the corrections.

If M be not equal to 0, we must add the fluent of $M \dot{x}$; in which case

$$V = \int M \dot{x} + Q q + c p + c'$$

Case 3.—If $M = 0$, but N is not $= 0$; that is if the form be

$$\dot{V} = N \dot{y} + \dot{P} p + \dot{Q} q;$$

then since $N = \frac{\dot{p}}{\dot{x}} + \frac{\ddot{Q}}{\dot{x}^2} = 0$,

we have by multiplying by $\dot{y} = p \dot{x}$, (because $p = \frac{\dot{y}}{\dot{x}}$)

$$N \dot{y} - p \dot{P} + p \frac{\ddot{Q}}{\dot{x}^2} \dot{x} = 0.$$

But $p \frac{\ddot{Q}}{\dot{x}^2} \dot{x} = \left(p \frac{\ddot{Q}}{\dot{x}} \right) - \dot{p} \frac{\dot{Q}}{\dot{x}} = \left(p \frac{\dot{Q}}{\dot{x}} \right) -$

$q \frac{\dot{Q}}{\dot{x}} \dot{x}$, which last expression being substituted for $p \frac{\ddot{Q}}{\dot{x}^2} \dot{x}$,

gives $N y = p \dot{P} - \left(p \frac{\dot{Q}}{\dot{x}} \right) + q \frac{\dot{Q}}{\dot{x}} \dot{x}$, whence

$$\dot{V} = p \dot{P} + P \dot{p} - \left(p \frac{\dot{Q}}{\dot{x}} \right) + q \dot{Q} + Q \dot{q};$$

and taking the fluents

$$V = P p + Q q + p \frac{\dot{Q}}{\dot{x}} + c,$$

c being the correction, as before.

We might continue thus to deduce from the general formula other particular ones, but the foregoing are sufficient for the solution of such problems as the limit of our article will admit of in this place, which, for the sake of a more ready reference, we will again repeat.

1. If the general form $\dot{V} = M \dot{x} + N \dot{y} + P \dot{p} + Q \dot{q}$ &c.

becomes $\dot{V} = N \dot{y} + P \dot{p}$

then we have $V = P p + c$ [a]

or $V = \int M \dot{x} + P p + c$ [b]

when M is not equal to 0.

2. If the formula be $\dot{V} = P \dot{p} + Q \dot{q}$

then will $V = Q q + c p + c'$ [c]

or $V = \int M \dot{x} + Q q + c p + c'$ [d]

when M is not equal to 0.

3. If the formula be $\dot{V} = N \dot{y} + P \dot{p} + Q \dot{q}$

then will $V = P p + Q q - p \frac{\dot{Q}}{\dot{x}} + c$ [e]

To which we may also add the following,

4. If the formula be $\dot{V} = P \dot{p} + R \dot{r}$,

then will

$$V = c p + R r - q \frac{\dot{R}}{\dot{x}} + c' \quad [f]$$

By means of which formulæ the following problems are readily solved.

PROBLEM I.

Required the relation of x and y , such that the fluent of $(ax - y) y \dot{x}$, or $\int (ax - y) y \dot{x}$, shall be a maximum, or a minimum.

Comparing this expression with $\int V \dot{x}$, (the analytical expression for the maximum or minimum property,) we see that $V = axy - y^2$, consequently $V = a y \dot{x} + (ax - 3y) \dot{y}$; which compared with the general formula,

$$\dot{V} = M \dot{x} + N \dot{y} + \&c.$$

gives $M = ay$, and $N = ax - 3y$, $P = 0$, $Q = 0$, &c.

But since $N = \frac{P}{\dot{x}} + \&c. = 0$, this becomes

$$ax - 3y^2 = 0, \text{ or } y = \sqrt{\frac{ax}{3}};$$

which is the relation of x and y required.

PROB. II.

Required the shortest curve that can be drawn between two points, or between two curves.

Here, if we take z to represent the curve, x the absciss, and y the ordinate, it will be necessary to fulfil the following condition, namely, that $\int \dot{z}$ be a minimum.

Now by the doctrine of fluxions, $\dot{z} = \sqrt{x^2 + y^2} =$

$\dot{x} \sqrt{1 + \frac{y^2}{x^2}} = \dot{x} \sqrt{1 + p^2}$; which being compared

with $\int V \dot{x}$, gives $V = \sqrt{1 + p^2}$, whence by taking the

fluxions on both sides, it becomes $\dot{V} = \frac{p \dot{p}}{\sqrt{1 + p^2}}$; and

M, N , &c. all equal to 0. Therefore comparing this with

the general value of V , we have $P = \frac{p}{\sqrt{1 + p^2}}$, and consequently from the formula [B] we have, — flux.

$\left(\frac{p}{\sqrt{1 + p^2}} \right) = 0$; therefore $p = a \sqrt{1 + p^2}$; and

by squaring $p^2 = a^2 + a^2 p^2$, or $(a^2 - 1) p^2 = -a^2$, whence

$p = \frac{\dot{y}}{\dot{x}} = \frac{a}{\sqrt{1 - a^2}}$; or $y \sqrt{1 - a^2} = a x$,

taking the fluents $y \sqrt{1 - a^2} = a x + c$, which is an

equation to a right line, as it ought to be.

PROB. III.

Required the curve of quickest descent between two given points. Fig. 16. Plate *Isoperimetry*.

Let A and B be the two given points, and AMB the required curve; draw PM perpendicular to AC ; and put $AP = x$, $PM = y$, $AM = z$: then since the time will be reciprocally as the square root of the height, it will be

required to find $\int \frac{\dot{z}}{\sqrt{y}}$, a minimum, but $\dot{z} = \sqrt{x^2 +$

y^2} , whence $\int \frac{\sqrt{x^2 + y^2}}{\sqrt{y}} = \int \frac{\sqrt{1 + \frac{y^2}{x^2}}}{\sqrt{y}} \dot{x} =$

$\int \sqrt{1 + p^2}$

$\int \frac{\sqrt{(1+p^2)}}{\sqrt{y}} \dot{x}$, a minimum, which compared with the minimum expression $\int V \dot{x}$, gives $V = \frac{\sqrt{(1+p^2)}}{\sqrt{y}}$; whence $\dot{V} = -\frac{\sqrt{(1+p^2)}}{2y^2} \dot{y} + \frac{p \dot{p}}{\sqrt{y} \sqrt{(1+p^2)}}$, which compared with formula [A], gives $M = 0$; $N = -\frac{\sqrt{(1+p^2)}}{2y^2}$; $P = \frac{p}{\sqrt{y} \sqrt{(1+p^2)}}$; $Q = 0$, &c.

Therefore, since by formula [a] $V = Pp + c$; therefore in this case $\frac{\sqrt{(1+p^2)}}{\sqrt{y}} = \frac{p^2}{\sqrt{y} \sqrt{(1+p^2)}} + c$, whence $\frac{1}{\sqrt{y} \sqrt{(1+p^2)}} = c$; or multiplying both numerator and denominator of this fraction by \dot{x} , it becomes $\frac{x}{\sqrt{y} \sqrt{(\dot{x}^2 + \dot{y}^2)}} = c$, which is reducible to $\dot{x} = \frac{c \sqrt{y}}{\sqrt{(1-c^2 y)}}$, an equation to a cycloid; which, therefore, is the curve required.

PROB. IV.

Required the curve which, by its revolution round its axis, generates the solid of least resistance. *Fig. 17.*

Let ABC be the required curve, which by its rotation generates the solid, DAC, of least resistance: draw PM perpendicular to AB; put AP = x , PM = y , and the arc AM = z : then we know from the principles of me-

chanics, that the resistance = $\int \frac{y \dot{y}^3}{\dot{x}^2 + \dot{y}^2}$, which must therefore be a minimum. Now this being put under the form,

$$\int \frac{y \dot{y}^3}{1 + \frac{\dot{y}^2}{\dot{x}^2}} \dot{x} = \int \frac{y \dot{p}^3}{1 + p^2} \dot{x}, \quad (\text{because } p = \frac{\dot{y}}{\dot{x}})$$

which being compared with the expression $\int V \dot{x}$, gives

$$V = \frac{y \dot{p}^3}{1 + p^2};$$

the fluxion of which expression being taken, gives

$$\dot{V} = \frac{\dot{p}^3 \dot{y}}{1 + p^2} + \frac{(3y \dot{p}^2 + y \dot{p}^3) \dot{p}}{(1 + p^2)^2};$$

$$\text{whence } M = 0; N = \frac{\dot{p}^3}{1 + p^2}; P = \frac{3y \dot{p}^2 + y \dot{p}^3}{(1 + p^2)^2}.$$

Hence by the foregoing form [a], and using $-c$ for a correction, we have

$$\frac{y \dot{p}^3}{1 + p^2} = \frac{3y \dot{p}^2 + y \dot{p}^3}{(1 + p^2)^2} - c,$$

which by reduction gives,

$$c(1 + p^2)^2 = 2y \dot{p}^3, \text{ and } y = \frac{c}{2 \dot{p}^3} + \frac{c}{\dot{p}} + \frac{c \dot{p}}{2};$$

but since $p = \frac{\dot{y}}{\dot{x}}$, or $p \dot{x} = \dot{y}$, we obtain

$$\dot{x} = -\frac{3c}{2 \dot{p}^3} \dot{p} - \frac{c}{\dot{p}^2} \dot{p} + \frac{c}{2 \dot{p}} \dot{p};$$

$$\text{whence, } x = \frac{3c}{8 \dot{p}^4} + \frac{c}{2 \dot{p}^2} + \frac{c}{2} \text{ hyp. log. } p + c';$$

by means of which equation, and that above, *viz.* $c(1 + p^2) = 2y \dot{p}^3$, the relative values of x and y are determined.

PROB. V.

Required the brachystochrone, or curve of quickest descent, when the length of the curve is given.

This is an isoperimetrical problem of the second order: those which we have been considering have only one condition enters, namely the minimum; but in the present problem, beside the minimum property, the isoperimetrical also enters; and we have, therefore, to find the variation of $(V - au)$, instead of V . See Woodhouse's Tract on Isoperimetry, p. 122.

Here by means of the comparison of $\int (V - au) \dot{x}$, with the minimum condition of the problem, we obtain

$$V = \frac{\sqrt{(1+p^2)}}{\sqrt{y}}, \text{ and } u = \sqrt{(1+p^2)};$$

$$\text{therefore } V - au, \text{ or } V' = \frac{\sqrt{(1+p^2)}}{\sqrt{y}} - a \sqrt{(1+p^2)},$$

and consequently,

$$\dot{V}' = -\frac{1}{2y^2} \sqrt{(1+p^2)} \dot{y}^2 + \left(\frac{1}{\sqrt{y}} - a \right) \times \frac{p \dot{p}}{\sqrt{(1+p^2)}}.$$

Hence we deduce, by comparing this with the general formula [A],

$$\begin{cases} N = -\frac{1}{2y^2} \sqrt{(1+p^2)} \\ P = \left(\frac{1}{\sqrt{y}} - a \right) \times \frac{p}{\sqrt{(1+p^2)}} \end{cases}$$

Hence again by formula [a],

$$\sqrt{(1+p^2)} \left(\frac{1}{\sqrt{y}} - a \right) = \frac{p^2}{\sqrt{(1+p^2)}} \left(\frac{1}{\sqrt{y}} - a \right) + c,$$

$$\text{or, } \left(\frac{1}{\sqrt{y}} - a \right) = c \sqrt{(1+p^2)};$$

whence again by reduction,

$$\dot{x} = \frac{c \sqrt{y \dot{y}}}{\sqrt{[1 - 2a \sqrt{y \dot{y}} + (a - c) y]}};$$

where, by taking the fluents, we have the relation between x and y , the absciss and ordinate of the curve.

If, instead of the length of the curve, the area had been given, then $\int u \dot{x} = \int y \dot{x}$, and consequently we should have,

$$V' = V - au = \frac{\sqrt{(1+p^2)}}{\sqrt{y}} - ay;$$

in which case,

$$P = \frac{p}{\sqrt{y} \sqrt{(1+p^2)}},$$

$$\text{and } \frac{\sqrt{(1+p^2)}}{\sqrt{y}} - ay = \frac{p^2}{\sqrt{y} \sqrt{(1+p^2)}} + c;$$

whence again,

$$\frac{1}{\sqrt{y} \sqrt{(1+p^2)}} = c + ay;$$

which by reduction becomes,

$$\dot{x} = \frac{(c + ay) \sqrt{y \cdot \dot{y}}}{\sqrt{[1 - y(c + ay)^2]}};$$

which expression, when $c = 0$, becomes

$$\dot{x} = \frac{ay \cdot \dot{y}}{\sqrt{(1 - a^2 y^2)}};$$

whence the relative values of x and y are determined in both cases.

PROB. VI.

Required the solid of least resistance, amongst all the solids of equal capacity.

Here, the same as in Prob. IV., we have $V = \frac{y p^3}{1 + p^2}$,

and $\int u \dot{x} = \int \pi y^2 \dot{x}$, (π being equal 3.14159, &c.) (see Woodhouse's Isoperimetry, p. 123.); therefore $V - au$

$$= V' = \frac{y p^3}{1 + p^2} - ay^2 \text{ (including } \pi \text{ in the quantity } a).$$

Hence $P = \frac{3y p^2 + y p^4}{(1 + p^2)^2}$, and by formula [a]

$$\frac{y p^3}{1 + p^2} - ay^2 = \frac{3y p^3 + y p^5}{(1 + p^2)^2} - c,$$

whence, by reduction, we obtain

$$\left\{ \begin{array}{l} (c - ay^2)(1 + p^2)^2 = 2y p^3, \text{ or } \\ (c - ay^2) d z^4 = 2y \dot{y}^3 \dot{x} \end{array} \right\}$$

which expressions will furnish the relative values of x and y .

If, instead of the condition of equal capacity, that of equal superficies be substituted, we have

$$V - au = V' = \frac{y p^3}{1 + p^2} - ay \sqrt{(1 + p^2)}, \text{ and}$$

$$P = \frac{3y p^2 + y p^4}{(1 + p^2)^2} - \frac{ay p}{\sqrt{(1 + p^2)}};$$

whence we deduce from formula [a]

$$\frac{y p^3}{1 + p^2} - ay \sqrt{(1 + p^2)} =$$

$$\frac{3y p^3 + y p^5}{(1 + p^2)^2} - \frac{ay p^2}{\sqrt{(1 + p^2)}} - c,$$

which, by reduction, becomes

$$c(1 + p^2)^2 = 2y p^3 + ay(1 + p^2)^{\frac{3}{2}};$$

$$\text{or, } c \dot{z}^4 = 2y \dot{y}^3 \dot{x} + ay \dot{z}^3 \dot{x}.$$

PROB. VII.

Given the length of a curve, to determine its nature, when the solid generated by its rotation is a maximum.

Making, as before, $\pi = 3.14159$, &c. we shall have

$$\int V \dot{x} = \int \pi y^2 \dot{x}, \text{ and } \int u \dot{x} = \int \sqrt{(1 + p^2)} \dot{x}.$$

Therefore V' or $V - au = \pi y - a \sqrt{(1 + p^2)}$;

and taking the fluxion on both sides,

$$V' = 2\pi y \dot{y} - \frac{ap \dot{p}}{\sqrt{(1 + p^2)}};$$

comparing this expression with the general one [A],

we have $P = -\frac{ap}{\sqrt{(1 + p^2)}}$; and, therefore, by

formula [a]

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$$\pi y^2 - a \sqrt{(1 + p^2)} = c - \frac{ap^2}{\sqrt{(1 + p^2)}};$$

and therefore

$$\sqrt{(1 + p^2)} = \frac{a}{\pi y^2 - c};$$

which, by reduction, becomes

$$p, \text{ or } \frac{\dot{y}}{\dot{x}} = \frac{\sqrt{[a^2 - (\pi y^2 - c)^2]}}{\pi y^2 - c}; \text{ or,}$$

$$\dot{x} = \frac{(\pi y^2 - c)}{\sqrt{[a^2 - (\pi y^2 - c)^2]}} \dot{y};$$

which, if $c = 0$, reduces to

$$\dot{x} = \frac{\pi y^2}{\sqrt{(a^2 - \pi^2 y^4)}} \dot{y}.$$

This last result agrees with Simpson's, but it is restricted, because c is not necessarily equal to 0.

PROB. VIII.

The length of a curve being given, it is required to determine its nature, when the area is a maximum.

Here, by proceeding as in the foregoing examples, we shall have

$$V' = \sqrt{(1 + p^2)} - ay,$$

and therefore,

$$P = \frac{p}{\sqrt{(1 + p^2)}};$$

and hence, by means of the formula [a],

$$\sqrt{(1 + p^2)} - ay = \frac{p^2}{\sqrt{(1 + p^2)}} + c;$$

Therefore,

$$\frac{1}{\sqrt{(1 + p^2)}} = c + ay,$$

which, being farther reduced, becomes

$$p = \frac{\dot{y}}{\dot{x}} = \frac{\sqrt{[1 - (c + ay)^2]}}{(c + ay)},$$

$$\text{or, } \dot{x} = \frac{(c + ay) \dot{y}}{\sqrt{[1 - (c + ay)^2]}};$$

the fluents of which being taken, we have

$$x = c' - \sqrt{[1 - (c + ay)^2]},$$

which is an equation to a circle.

PROB. IX.

Required the curve that generates the solid of the least surface, the area being given.

Here $V = 2\pi y \sqrt{(1 + p^2)}$, and $u = y$;

therefore V' , or $V - au = 2\pi y \sqrt{(1 + p^2)} - ay$,

and $V' = [2\pi \sqrt{(1 + p^2)} - a] \dot{y} + \frac{2\pi y p}{\sqrt{(1 + p^2)}} \dot{p}$;

whence, by comparison with formula [A],

$$P = \frac{2\pi y p}{\sqrt{(1 + p^2)}};$$

then, again, by formula [a], we have

$$2\pi y \sqrt{(1 + p^2)} - ay = \frac{2\pi y p^2}{\sqrt{(1 + p^2)}} + c,$$

which, by reduction, becomes

$$p = \frac{\dot{y}}{\dot{x}} = \frac{\sqrt{[4\pi y^2 - (c + ay)^2]}}{c + ay}, \text{ or,}$$

3 R

$\dot{x} =$

$$\dot{x} = \frac{(c + ay) \dot{y}}{\sqrt{[4\pi y^2 - (c + ay)^2]}}$$

If, instead of the area, the length of the curve had been given, then we should have had

$$\int u \dot{x} = \int \dot{z} = \int x \sqrt{(1 + p^2)}; \text{ and } u = \sqrt{(1 + p^2)}.$$

Therefore $V' = 2\pi y \sqrt{(1 + p^2)} - a \sqrt{(1 + p^2)}$, and consequently, by formula [A],

$$P = \frac{2\pi y p - a p}{\sqrt{(1 + p^2)}};$$

whence, again, by formula [A], we have

$$(2\pi y - a) \sqrt{(1 + p^2)} = \frac{(2\pi y - a) p^2}{\sqrt{(1 + p^2)}} + c;$$

whence, by reduction,

$$\dot{x} = \frac{c \dot{y}}{\sqrt{[(2\pi y - a)^2 - c^2]}}$$

the fluents of which expression being taken, gives

$$x = \frac{c}{2\pi} \text{hyp. log.}$$

$$[(2\pi y - a) + \sqrt{(2\pi y - a)^2 - c^2}] + c',$$

and therefore the required curve is the catenary.

PROB. X.

Of all isoperimetrical curves, drawn between B and N, (fig. 15.) to find BFN such, that BZN shall contain the greatest area, PZ being a function of PF. See the foregoing historical sketch.

Let PF = y, and PZ a function of y = Y; then $\int V \dot{x}$ corresponds to $\int Y \dot{x}$; and $\int u \dot{x}$ to $\int \sqrt{(1 + p^2)} \dot{x}$.

Hence $V + au$, or $V' = Y + a \sqrt{(1 + p^2)}$,

$$\text{and } \dot{V} = \frac{Y \dot{y}}{y} + \frac{a p \dot{p}}{\sqrt{(1 + p^2)}};$$

whence we have, by comparison of formula [A],

$$P = \frac{a p}{\sqrt{(1 + p^2)}};$$

and hence, again, by form [a] is deduced

$$Y + a \sqrt{(1 + p^2)} = \frac{a p^2}{\sqrt{(1 + p^2)}} + c,$$

$$\text{or, } \frac{a}{\sqrt{(1 + p^2)}} = c - Y, \text{ and by reduction}$$

$$p = \frac{\dot{y}}{\dot{x}} = \frac{\sqrt{[a^2 - (c - Y)^2]}}{c - Y};$$

and consequently,

$$\dot{x} = \frac{(c - Y) \dot{y}}{\sqrt{[a^2 - (c - Y)^2]}},$$

the equation of the curve.

In the equation, as it stands, there are two arbitrary undetermined quantities a and c. The integration of the equation would introduce a third; and to determine these three, we have given the two points B and N, and the length of the curve.

ISOPOGON, in Botany, from *ισος*, equal, and *πωγων*, a beard, because the seeds are every where equally bearded.

Brown Tr. of Linn. Soc. v. 10. 71. Prodr. Nov. Holl. v. 1. 365. Class and order, *Tetrandria Monogynia*. Nat. Ord. *Proteaceae*.

Eff. Ch. Perianth (rather corolla) four-cleft, with a slender permanent tube. No scales under the germen. Style entirely deciduous. Stigma tapering or cylindrical. Not sessile, swelling, hairy all over. *Brown*.

Mr. Brown, in the places above quoted, defines 12 species of this genus, all natives of New Holland, such of which as have come under the notice of other botanists have been confounded with the Linnæan *Protea*. They are rigid shrubs, with smooth leaves, which are either flat or thread-shaped, divided or entire. Heads terminal, rarely axillary. Flowers either very densely imbricated in the form of a globose *strobilus*, or fastigiate on a flattish common receptacle, furnished with more or less of an involucre, and beset with crowded deciduous scales.—Examples of this genus are

1. *anethifolia*. (*Protea anethifolia*; Salisb. Prodr. 48. P. *acutifera*; Cavan. Ic. v. 6. 33. t. 549.)—Leaves once or twice pinnatifid, thread shaped, furrowed above: their segments nearly erect. Branches smooth. Tube of the flower downy; segments smooth, bearded at the tip.—Native of heathy ground on the east coast of New Holland, near Port Jackson.

1. *anemonifolia*. (*Protea anemonifolia*; Salisb. Prodr. 48. Sims in Curt. Mag. t. 697. Andr. Repof. t. 332. P. *tridactylides*; Cavan. Ic. v. 6. 33. t. 548.)—Leaves once or twice three-cleft; segments linear, flat, rather spreading, smooth beneath. Scales of the cone spongy.—Found on stony heaths near Port Jackson. The flowers are yellow.

We confess this genus seems too nearly related to Mr. Brown's *Petrophila*, with which it agrees altogether in habit, differing chiefly in the fruit of *Petrophila* being only partially hairy. To this latter belongs *Protea pulchella*, figured by Dr. Sims in Curt. Mag. t. 796.

ISOPSEPHUS, *ισοψηφος*, in *Antiquity*, an appellation given to judges, who had equal jurisdiction and authority; it was likewise applied to a case where the votes were equal on both sides. Another sense is given to it, viz. when the letters of different words make up the same sum, they were said to be *ισοψηφα σημασια*; for the Greeks had no other cyphers to number with but the letters of their alphabet; so that α signified one, β two, γ three, &c. But beside words, the ancients had likewise whole verses of this kind; and it is pretended that there are several such verses in Homer. Hist. Acad. Inscript. vol. iii. p. 311, seq.

ISOPYRUM, in Botany, from *ισος*, equal or like, and *πυρος*, wheat, a name adopted from Dioscorides, whose *ισοπυρον*, however, is very difficult to ascertain. He describes it as having the leaf terminated by a tendril. Various plants have been taken for it by different botanists, amongst others, surely with little probability, the *Aquilegia*, or Columbine, which we mention here because it appears to have induced Linnæus to choose the name for the present genus, very much akin to *Aquilegia*, and still more distinguished for delicacy and elegance.—Linn. Gen. 282. Schreb. 378. Willd. Sp. Pl. v. 2. 1334. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2. 271. Salisb. Tr. of Linn. Soc. v. 8. 306. Juss. 233. Gertn. t. 65.—Class and order, *Polyandria Polygynia*. Nat. Ord. *Mulsifliquæ*, Linn. *Ranunculaceæ*, Juss.

Gen. Ch. Cal. none. Cor. Petals five, ovate, equal, spreading, deciduous. Nectaries five, equal, tubular, very short, inserted into the receptacle within the petals, three-lobed at their orifice, the outer lobe largest. Stam. Filaments numerous, capillary, shorter than the corolla; anthers simple.

simple. *Pist.* Germens several, ovate or oblong, superior, sessile, styles simple, scarcely so long as the germens; stigmas obtuse. *Peric.* Capsules several, sessile, leguminous, oblong, of one cell and one valve, keeled at the outside, bursting at the inner edge. *Seeds* numerous, attached in two rows to the edge of the capsule.

Eff. Ch. Calyx none. Petals five, deciduous. Nectaries tubular, three-cleft. Capsules sessile, of one cell and one valve. Seeds numerous, marginal.

1. *I. fumarioides*. Linn. Sp. Pl. 783. (*Helleborus fumariae* foliis; Ammann. Ruth. 74. t. 12.)—Stipulas awl-shaped. Leaflets pinnatifid. Capsules nearly cylindrical. — Native of moist shady places, near rivers, in Siberia, flowering in spring and summer. It is sometimes cultivated in gardens, as being not only curious, but an elegant little annual plant, with the habit and glaucous hue of a *Fumaria*, to several of which genus its leaves bear a great resemblance, in their pinnatifid obovate leaflets. The flowers, however, are totally different, resembling a *Thalictrum*, small, whitish, short-lived, on long simple stalks. Capsules about ten or fifteen, spreading, pale green, near half an inch long, pointed with the permanent styles.

2. *I. thalictroides*. Linn. Sp. Pl. 783. Jacq. Austr. t. 105.—Stipulas ovate. Leaflets three-cleft, dilated. Capsules ovate.—Native of shady rather moist places, in the mountains of Italy, Carniola, Austria, &c. flowering in April and May, and soon ripening its seed. Root creeping, perennial. Stem a span high or more, naked below, smooth. Leaves ternate, leaflets more or less three-cleft, broadish, smooth, resembling those of an *Aquilegia*, or *Thalictrum*. Flowers white, with yellow stamens, not unlike some small *Anemone*. Capsules only two or three, ovate, on a globular receptacle.

Such are the only certain species. *I. aquilegioides* of Linnæus appears to be a nonentity, its synonyms, as far as they can be made out, belonging to *Aquilegia viscosa*, which is Haller's *Isopyrum*, n. 1190.

Mr. Salisbury, in Tr. of Linn. Soc. v. 8. 305, has established, by the name of *Coptis*, a very natural genus, though distinguished from *Isopyrum* chiefly by having stalked germens and capsules. Of this one species is *Helleborus trifolius* of Linneus, Fl. Dan. t. 566; the other is *C. asplenifolia* of Salisbury, of which we have specimens and a drawing from Mr. Menzies, who gathered the plant on the west coast of North America. This last, strange to tell! appears, by specimens from Thunberg, to be his *Thalictrum japonicum*, Tr. of Linn. Soc. v. 2. 337, called in Fl. Jap. 364. *Dilynamifolia Salvia similis*, though nothing can be less suitable than the latter description. He informs us he had never seen the flower, only the fruit.

ISORA, a Malabar name for some species of the *Helicteres* of Linnæus, and adopted by Plumier to designate that genus. See *HELICTERES*.

ISOSCELES TRIANGLE, of ἰσος , equal, and σκελος , leg, is a triangle which has two equal sides. In an isosceles triangle, (FDE Plate VIII. *Geometry*, fig. 105.) the angles y and z , opposite to the equal sides, are equal: and a line drawn from the top or vertex F, cutting the base into two equal parts, is perpendicular to the base. The same line also bisects the vertical angle of the triangle. It appears likewise that if the equal sides be produced, the angles under the base will be equal, the sum of those above and below respectively being equal to two right angles. And if the vertical angles of two isosceles triangles be equal, the two triangles will be equiangular. Moreover, every equilateral triangle must be equiangular.

ISOTONIC Scale of Music, or the Equal Temperament Scale, is that in which the octave is divided into twelve equal parts; of course, each half note is equal $1 \div 12\sqrt{2} = 51 \Sigma + f + 4\frac{5}{12} m$, which is sometimes called a mean semitone, and this, a system of mean semitones. The following table shows some of the most useful particulars of this system, viz.

1	2	3	4
C	.6989700	.500000	612 Σ + 12 f + 53 m
B	.7240558	.52973	561 Σ + 11 f + 48 $\frac{7}{12} m$
b B	.7491417	.56123	510 Σ + 10 f + 44 $\frac{1}{2} m$
A	.7742275	.59460	459 Σ + 9 f + 39 $\frac{3}{4} m$
* G	.7993133	.62996	408 Σ + 8 f + 35 $\frac{1}{3} m$
G	.8243992	.66742	357 Σ + 7 f + 30 $\frac{1}{12} m$
* F	.8494850	.70710	306 Σ + 6 f + 26 $\frac{1}{2} m$
F	.8745708	.74915	255 Σ + 5 f + 22 $\frac{1}{12} m$
E	.8996567	.79370	204 Σ + 4 f + 17 $\frac{3}{4} m$
b E	.9247425	.84090	153 Σ + 3 f + 13 $\frac{1}{2} m$
D	.9498283	.89090	102 Σ + 2 f + 8 $\frac{5}{6} m$
* C	.9749142	.94387	51 Σ + f + 4 $\frac{5}{12} m$
C	.0000000	1.000000	
Notes.	Common Logarithms.	Lengths of Strings.	Farey's Notation of the Intervals.

The last column of this table was published in the Philosophical Magazine, vol. xxix. p. 347; in the xxxvith vol. p. 47, schol. 7, the temperaments of the concords in this system will be found, and in vol. xxxv. p. 452, he beats of all the concords. Broadwood and some other tuners of pianofortes pretend, it is said, that they tune them to an equal temperament, but which is very much to be doubted. On the organ, it seems clear, as Mr. Smyth observes in the Phil. Mag. vol. xxxvi. p. 435, that an equal temperament never has been, and we may perhaps say, never will be practised: however many advocates this system may have had among speculative writers, among whom have been mentioned D'Alembert, Cavallo, Chladni, Couperin, Davis, Des Cartes, Emerson, Marpurg, Merrick, Merfennus, Rameau, Ricci, &c. Mr. Farey, in proposing what he calls his equal temperament, in the Phil. Mag. vol. xxviii. p. 65, expressly stated his object to be, to enable those to tune it who might wish to try it, and not as recommending its adoption. See EQUAL TEMPERAMENT.

ISPAHAN, in *Geography*, the capital city of modern Persia, situated in the province of Irak, on the small river Zenderud, which rises in the mountains of Galabat, three days' journey towards the north; but Abas the Great, at a prodigious expence, pierced some mountains about 30 leagues from Ispahau, and introduced another stream, so that the Zenderud was as large during the spring, as the Seine at Paris in the winter: for, in that season, the snows on the high range of mountains melted, and very much swelled the river. The city is surrounded by walls of earth, which are suffered to remain in bad repair, and which are concealed by the adjoining houses and gardens. It has eight gates, which, according to Chardin, could not be shut; and its streets are narrow, devious, and badly paved. This writer computes its circuit, the suburbs included, at about 24 miles, and its inhabitants, by the lowest estimate, at 600,000. But the royal square, or Meidan Shah, and its grand market, the palace of the Sefi, and those of the grandees, the mosques, the public bath, and other edifices, are magnificent and splendid. Its canals, the plantations of lofty plane trees on

both sides of the streets, and the frequent waterings of them, contribute not only to its beauty, but its salubrity. The royal square is 440 paces long, and 160 broad, and is surrounded with a canal built with bricks, cemented with black mortar, which in time becomes harder than free-stone. The royal mosque is situated at the S. end of this square, and its portico is richly ornamented with a thousand figures of a rich profusion of gold and azure; the whole being also inlaid with enamelled squares, and a frieze encompassing it of the same materials. The royal palace, and the "haram," or women's apartment, are very splendid buildings. The former is nearly five miles in compass; its great portico stands in the royal square, and is built to a great height with porphyry. By the Persians it is regarded as sacred. The suburb of Julfa, or Yulfa, was very large, and possessed by the Armenians, whose cemetery was near the mountains of Ispahan, called Kou Sofa, or a mountain in the form of a terrace, and also Tag Rustan, the hill or throne of Rustan. This city is said to be encompassed by 1460 villages, the inhabitants of which subsist chiefly by their manufactures of silk and wool. Its environs are pleasant, and much diversified by the vicinity of mountains. Ispahan was taken by Timur Bec in the year 1387; when the inhabitants ransomed their lives by the payment of a large sum; but an insurrection happening in the night, Timur ordered all the inhabitants to be put to the sword; and in this massacre it is computed that 70,000 persons were killed by the soldiers, and their heads piled in heaps on the walls of the city. In 1722, it was taken by the Afghans, under Mahmoud, after a long siege, which occasioned the death of many of its inhabitants by famine. In 1727 it was recovered from the Afghans by Nadir Shah. By these repeated attacks, Ispahan was greatly reduced, so that a Persian merchant assured Mr. Hanway that not above 5000 houses were inhabited. N. lat. 32° 24' 34". E. long. 51° 50'.

ISPIDA, or KING-FISHER, in *Ornithology*. See ALCEDO.

ISPIRA, in *Geography*, a town of Turkish Armenia; 74 miles N.E. of Erzerum.

ISQUINTIA, a town of Mexico, in the province of Guatemala; 30 miles W.N.W. of Guatemala. N. lat. 14° 32'. W. long. 93°.

ISQUITENANGO, a town of Mexico, in the province of Yucatan; 90 miles S. of Chiapa dos Espagnols.

ISQUITEPIC, a town of Mexico, in the province of Guaxaca; 40 miles W.N.W. of Guaxaca.

ISRAEL, in *Scripture History*, Heb. **יִשְׂרָאֵל**, who prevails with God, formed of **יָשַׁר**, *sharab*, to govern, and **אֵל**, *el*, God, a name given to the patriarch Jacob by the angel who wrestled with him at Mahanaim, or Penuel, Gen. xxxii. 1, 2. 28, 29, 30. This name was afterwards applied to the descendants of Jacob in general, hence called Israelites, as well as to Jacob himself, and also to the ten tribes who formed a kingdom distinct from that of Judah. These tribes revolted during the reign of Rehoboam, under the conduct of Jeroboam, who became head of this new monarchy, styled "the kingdom of Israel" in opposition to that of Judah. See JEWS.

ISSA, in *Ancient Geography*, a town of the island of Lesbos; more anciently called Himeria.—Also, an island of Illyria, in the Adriatic gulf, upon the coast of Dalmatia, with a town of the same name. Strabo mentions it as a very celebrated island.

ISSACHAR, one of the twelve tribes of Israel, derived from the fifth son of Jacob, whose lot was assigned to him in one of the best parts of the land of Canaan. It was situated in Lower Galilee, and bounded by the Mediter-

anean on the W., by Zebulun on the N., by the Jordan on the E., which parted it from that of Gad, and on the S. by the half tribe of Manasseh. Its most remarkable places were mounts Carmel and Gilboah, the valley of Jezreel, and the great plain of Megiddo, called also the plain of Galilee, and now Saba, from a castle built upon it, and famed, like that of Jezreel, for the many battles fought upon it, and also for the abundance of corn, wine, oil, &c. which it produced.

ISSAGUNGE, in *Geography*, a town of Hindoostan, in Oude; 35 miles N.E. of Kairabad.

ISSAPOUR, a town of Hindoostan, in Oude; 25 miles N.E. of Lucknow.

ISSAWARRA, a town of Hindoostan, in Oude; 15 miles S.E. of Kairabad.

ISSE HEAD, a cape of Denmark, at the northern extremity of the island of Samsoe. N. lat. 56° 3'. E. long. 10° 26'.

ISSEDON, or ESSEDON, in *Ancient Geography*, a town of Seythia, on the other side of the Imaus.—Also, a town of Serica, situated E.N.E. of the former.

ISSEDONES, or ESSEDONES, a people of Serica according to Ptolemy; but Pomponius Mela places them in the vicinity of the Palus-Mæotides; Pliny joins them to the Sauromatæ, and assigns them an habitation near the Colchide. Herodotus speaks of Issidones as neighbours to the Massagetæ, as a numerous people, and living to the W. of the Caspian sea. Herodotus, who speaks of the customs and religion of the Issidones (l. iv.), says, that when any one of them has lost his father, all his relations bring him a number of cattle, whose carcases they cut in pieces, and in the same manner cutting the body of the deceased father, they mix all the pieces of flesh together, and serve them up at an entertainment, reserving only the head of the deceased parent, which they set in gold, and use as an idol, to which they every year offer solemn sacrifices.

ISSELBURG, in *Geography*, a town of the duchy of Cleves, on the Issel, containing a Lutheran and Calvinist church; 14 miles E.N.E. of Cleves. N. lat. 51° 53'. E. long. 6° 35'.

ISSELMOND, an island in the river Meuse, opposite to Rotterdam, with a town in it of the same name.

ISSELORT, a town of Holland, in Guelderland, situated at the separation of the Rhine and Issel near Arnheim.

ISSELSTEIN, a town of Holland, belonging to the state of Utrecht, and seated on the river Issel; it is the capital of a small territory formerly belonging to William III. king of England; five miles S. of Utrecht.

ISSENBRON, a town of Bavaria, in the principality of Aichstatt; six miles E.N.E. of Aichstatt.

ISSER, a river of Algiers, which joins the Tafna, near its mouth; anciently called "Assanus."

ISSESUCAR, a town on the S. coast of the island of Java; 70 miles S.W. of Batavia.

ISSICUS SINUS, in *Ancient Geography*, a gulf of the Mediterranean sea, between Syria and Cilicia.

ISSIGEAC, in *Geography*, a town of France, in the department of the Dordogne, and chief place of a canton, in the district of Bergerac; nine miles S.S.E. of Bergerac. The place contains 879, and the canton 8316 inhabitants, on a territory of 210 kilometres, in 21 communes.

ISSIN, a town of Persia, in the province of Kerman, whither many of the inhabitants of Gomron retreat during the unhealthy season; six miles N. of Gomron.

ISSINI, a kingdom of Africa, on the Ivory Coast, consisting of 12 or 13 villages. From the Rio de Suero da Colla

Costa to cape Apollonia, the coast is low and even, extending itself for a course of 12 miles eastward, bordered with large trees, and covered with villages, the chief of which are Boqun, Issini Peguena, Great Issini, Albiani, Tabo, and Akaniimina. The first stands at a small distance from the shore, near the mouth of the river Da Costa, surrounded by woods and pleasantly situated. Issini Peguena, and Great Issini, are both situated on the sea-coast, at the distance of three or four miles, and between them is a number of villages. Three of them are considerable. Great Issini is built at the entrance of a small river, which, during the dry season, is lost in the sands, but discharges itself into the sea during the rainy months. This town was pillaged and burnt by the inland Negroes in 1681; but has since recovered its importance by the addition of a great number of houses and inhabitants. Where the river empties itself into the sea, it forms a small island, very commodious for building a fort; but no such defence has been attempted by the Europeans. Great Issini is celebrated for the purity of its gold, which probably comes from the kingdom of Assiento, at the source of the Rio de Suero da Costa, a country rich in gold, but little known to the Europeans. East of Issini are the little districts and towns of Albiani and Tabo, the former six miles and the latter ten from it, both surrounded by high groves of palms, seen at a great distance at sea, and much frequented by European shipping. A mile further east, and half a mile west of cape Apollonia, stands the village Akaniimina, on a rising ground; commanding an extensive sea and land prospect. The interior country between Boqun and this village, is high, rugged, and mountainous, but affording some fine gold, ivory, and formerly a few slaves. The gold dust of these two places is commonly found at the depth of six fathoms, for two miles along the coast; and the Negroes mix it with pulverized copper so expertly, that it requires touching to discover the fraud.

ISSOIRE, a town of France, and principal place of a district, in the department of the Puy de Dôme, seated on the Couze, near the Allier; 15 miles S.W. of Clermont. The place contains 5095, and the canton 14,696 inhabitants, on a territory of 155 kilometres, in 15 communes. N. lat. 45° 32'. E. long. 3° 19'.

ISSONG, in *Botany*, a name given by the people of Guinea to a species of plant, which they infuse in water, and afterwards boil, and then wash the head with it, as a cure for all kinds of the head-ach. It is a plant described by the botanical writers under the name of *pisum vesicarium fructu nigro, alba macula notato*, the bladder pea, with a black fruit marked with a white spot; and called by the people of Malabar, where it also grows very plentifully, *ulinga*. It is also found in Barbadoes and Jamaica, and is there called *parsley*. Phil. Trans. N° 232.

ISSOUDUN, in *Geography*, a town of France, and principal place of a district, in the department of the Indre, on the Theols; 18 miles N.E. of Chateauroux. The place contains 10,156, and the two cantons into which it is divided 23,297 inhabitants, on a territory of 662½ kilometres, in 27 communes. This place has considerable manufactures. N. lat. 46° 56' 9". E. long. 1° 59' 12".

ISSUABLE TERMS, in *Law*, a name applied to Hilary or Trinity terms, from the making up of the issues in those terms.

ISSUANT, ISSUING, in *Heraldry*, is understood of a lion, or other animal, in a coat of arms, that seems just coming out from under a chief, fesse, a house, a wood, or the like; and only shews half his body.

It is not very easy to distinguish the lion issuant from the

lion naissant: some say the issuant is that which comes out from the bottom of the chief, shewing his head, neck, the tip of his fore-legs and his tail, against the chief of the coat; whereas the naissant has its rise about the middle of the field, and shews all his fore-part, with the tip of his tail, as if he were rising out of the earth.

ISSUE, in *Common Law*, has divers applications, being sometimes taken for the children begotten between a man and his wife—sometimes for profits growing from amercements or fines—sometimes for profits of lands and tenements—but more frequently for the point of matter depending in suit, whereupon the parties join, and put their cause to the trial of the jury.

On all these occasions, issue has but one signification, which is, an effect of a cause preceding: as the children are the effect of the marriage between the parents; the profits growing to the king or lord, from the punishment of any man's offence, are the effect of his transgression; the point referred to the trial of twelve men, is the effect of pleading or process.

Issues concerning causes are of two kinds; that upon matter of fact, and that upon matter of law. An issue in *fact* is when the plaintiff and defendant have agreed upon a point to be tried by a jury; and issue in *law* is when there is a demurrer to a declaration, plea, &c. and a joinder in demurrer, which is an issue at law to be determined by the judges. (See DEMURRER.) Issues in *fact* are either *general* or *special*. *General*, seems to be that whereby it is referred to the jury to bring in their verdict, whether or no the defendant hath done any such thing as the plaintiff lays to his charge.

For example, if it be an offence against any statute, and the defendant plead not guilty; this being put to the jury, is called the *general issue*.—So, if a man complains of a private wrong, which the defendant denies, and pleads no wrong, nor disseisin; and this be referred to the jury; it is likewise the general issue. *Special*, is that, wherein special matters being alleged by the defendant in his offence, both parties join on this point, and so go to a demurrer, if it be *questio juris*; or else to a trial by the jury, if it be *questio facti*: as in assault and battery, where the defendant pleads that the plaintiff struck first.

ISSUE, *Collateral*. See REPRIEVE.

ISSUE, *Feigned*, in *Chancery*, is used when a matter of fact is strongly controverted, and the court directs the matter to be tried by a jury: but as no jury can be summoned to attend this court, the fact is usually directed to be tried at the bar of the court of king's bench, or at the assizes upon a feigned issue. For, in order to bring it there, and have the point in dispute, and that only, put in issue, an action is brought, wherein the plaintiff, by a fiction, declares that he laid a wager of 5*l.* with the defendant, that A was heir at law to B, and then avers that he is so, and therefore demands the 5*l.* The defendant allows the feigned wager; but avers that A is not the heir to B: and thereupon that issue is joined, which is directed out of chancery to be tried, and thus the verdict of the jurors at law determines the fact in the court of equity. These feigned issues seem to be borrowed from the *sponsio judicialis* of the Romans; and are also frequently used in the courts of law, by consent of the parties, to determine some disputed right without the formality of pleading, and thereby to save much time and expence in the decision of a cause. Blackst. Com. book iii. p. 452.

ISSUES on *Sheriffs* are for neglects and defaults, by amercement and fine to the king, levied out of the issues and profits of their lands; and double or treble issues may be laid on a sheriff.

a sheriff for not returning writs, &c. But they must be taken off before they are estreated into the exchequer, by rule of court, on good reason shewn. Issues shall be levied on jurors, for non-appearance; though on reasonable excuse proved by two witnesses, the justices may discharge the issues. See DISTRESS, DISTINGUISH, and PROCESS.

ISSUE denotes, in *Surgery*, an ulcer made designedly by the practitioner, and kept open a certain time, or even the patient's whole life, for the cure or prevention of a variety of diseases. The physician, in his practice, has frequent occasion to recommend the making of an issue, and the surgeon finds it a principal means of relief in several important cases; as, for instance, the white-swelling, the disease of the hip-joint, caries of the vertebræ, &c. Many persons are never in health, or at least fancy themselves always ill, unless they have an issue in some part of their body or another. Making an issue, indeed, is not unfrequently considered as an imitation of nature, who, of her own accord, often forms ulcers in various parts of the body (as is not uncommonly conjectured) for the purpose of discharging pernicious humours, whereby people are supposed to be freed from grievous disorders, and have their health preserved. The humoral pathologists were excessively partial to these notions, which, at the present time, will be found by every experienced practitioner to influence the mass of mankind, and render the formation of issues more common than perhaps is consistent with the better established principles of medical science. Few old subjects will allow a sore of long standing to be dried up, (as the expression is,) without requiring the surgeon immediately afterwards to make an issue for them. When an ulcer has existed a great length of time, the constitution may possibly become so habituated to it, that the health may really suffer from its being healed. We have often seen asthmatic complaints, and severe head-aches follow the cicatrization of an old ulcer; but whether they would have happened, if an issue had been made in time, we cannot undertake to determine positively, though the plan is commendable both as rational and exempt from danger. Whatever may be the solidity of the theories which have been offered by medical writers in regard to issues, the practitioner, who has his eyes open, cannot fail to see the benefit often derived from such means; and if there be any unquestionable facts in medicine and surgery, we may confidently set down amongst them the frequent possibility of relieving one disease by exciting another of a less grievous and more curable nature.

Surgeons of the present day have only two ways of making an issue; one is with a lancet, or scalpel; the other with caustic.

The place for the issue being fixed upon, the surgeon and his assistant are to pinch up a fold of the integuments, and with a lancet, or knife, make in them an incision of sufficient size to hold a pea, or as many peas as may be thought proper. The pea or peas are then to be placed in the cut, and covered with a piece of adhesive plaster, a compress and bandage. The peas first inserted need not be removed for three or four days, when suppuration will have begun; but the issue is afterwards to be cleaned and dressed every day, and have fresh peas put into it. The preceding is the ordinary method of making such issues as are intended to contain only one or two peas.

When the issue is to be larger, which is generally proper in cases of diseased vertebræ, white-swellings, &c. the best plan is to destroy a portion of the integuments with caustic. The kali purum, blended with quicklime, is mostly preferred for this purpose. The situation and size of the issue

having been determined, the surgeon is to take care that the caustic does not extend its action to the surrounding parts. With this view he is to take a piece of adhesive plaster, and having cut a hole in it of the exact shape and size of the issue intended to be made, he is to apply it to the part. This the plaster will defend the adjacent skin from the effects of the caustic, while the uncovered portion of integuments, corresponding to the hole in the plaster, is that which is to be destroyed. The caustic is to be taken hold of with a bit of lint or tow, and its end, having been a little moistened with water, is to be steadily rubbed upon the part of the skin where the issue is to be formed. The frictions are to be continued, till the whole surface intended to be destroyed assumes a darkish corroded appearance. The caustic matter may now be carefully washed off with some wet tow. The plaster is to be removed, and a linseed poultice applied. As soon as the eschar is detached, or any part of it is loose enough to be cut away without pain or bleeding, the peas are to be inserted and confined in their proper place with a piece of adhesive plaster. Some use beans for the purpose; others beads, which answer very well, and have the advantage of serving for any length of time, when washed and cleaned every day. If the issue is at all of a longitudinal shape, the peas, beans, or beads may be more easily kept in their places when strung upon a thread.

Issues ought always to be made, if possible, in a situation where the peas will not be much disturbed in the ordinary motions of the body, nor interfere with the actions of the muscles. The interspaces between the margins and insertions of muscles are deemed the most eligible places. Thus, issues in the arm are usually made just at the inferior angle of the deltoid muscle, by the side of the external edge of the biceps. In the lower extremities issues are often made at the inner side of the thigh, immediately above the knee, in a cavity readily felt there with the fingers. Sometimes issues are made upon the inside of the leg, just below the knee. The nape of the neck is a common place for them. In caries of the vertebræ they are made on each side of the spinous processes. In diseased hips they are formed in a depression just behind and below the trochanter major. When the nature of the case does not fix the situation of an issue particularly, the arm should be preferred to the leg, as issues upon the upper extremity, especially the left arm, are much less annoying than upon either of the lower limbs.

The great art of keeping an issue open for a long while, is always to maintain an equal and effectual pressure upon the peas, by which means they will be confined in their places, and the granulations hindered from rising. Compresses of pasteboard and sheet lead will often be found highly serviceable.

IS-SUR-TILLE, in *Geography*, a town of France, in the department of the Côte d'Or, and chief place of a canton, in the district of Dijon; 4 miles N. of Dijon. The place contains 1598, and the canton 10,170 inhabitants, on a territory of 355 kilometres, in 23 communes. N. lat. 47° 3'. E. long. 5° 9'.

ISSUS, in *Ancient Geography*, a town of Asia, in Cilicia, situated on the sea coast. This town was large, rich, and populous. It is famous for the battle fought by Alexander in the year 333 B.C. in which he defeated the Persians, and took as prisoners the wife, mother, and daughters of Darius.

ISSY L'EVEQUE, in *Geography*, a town of France, in the department of the Saône and Loire, and chief place of a canton,

a canton, in the district of Autun; 19 miles S.S.W. of Autun. The place contains 1715, and the canton 5349 inhabitants, on a territory of 220 kilometres, in 7 communes.

ISTAD, *Str.* a small island in the Grecian Archipelago, near the S.E. coast of Argentiera.

ISTAKAR, a town of Persia, in the province of *Fars* (which see), at a small distance N. of Shiraz.

ISTAN, a town of Spain, in the province of Grenada; 6 miles S.E. of Monda.

ISTANNA, a country of Africa, E. of Benin.

ISTAPA, a town of Mexico, in the province of Culiacan; 40 miles E. of Culiacan.

ISTAPAN, a town of Mexico, in the province of Guadalajara; 15 miles N.E. of St. Miguel.

ISTECHIA, a town of the Morea, in the gulf of Coron; 7 miles S. of Scardamula.

ISTEFAN, a town of Asiatic Turkey, in the province of Natolia; 20 miles N. of Sinob.

ISTENAZ, a town of Asiatic Turkey, in the province of Caramania; 18 miles W. of Satalia.

ISTEPEC, a town of Mexico, in the province of Guatemala; 12 miles N. of St. Salvador.

ISTER, in *Ancient Geography*, the name which the Greeks gave to the river which we call the *Danube*; which see.

ISTESSO, *L'ISTESSO, Ital. in Music*, the same sound, air, or interval. Domenico Scarlatti, in Roscengrave's edition of his first book of Lessons, has *l'istesso differente* for the same air, varied; and Padre Martini, for exactly the same thing, has *stesso, stessissimo*.

ISTHÆVONES, or ISTÆVONES, in *Ancient Geography*, a people of Germany, who, according to Pliny (l. iv. c. 14.), were situated near the Rhine, and of whom the Cimbri, in the interior of the country, formed a part.

ISTHIA, *Ισθμία*, or ISTHMIAN Games, *Ludi Isthmii*, were solemn sports, being one of the four sacred games celebrated in ancient Greece.

They were called *Isthmian*, because they were celebrated in the Corinthian isthmus, a neck of land by which Peloponnesus is joined to the continent.

Plutarch, in the life of Theseus, tells us they were instituted by that hero to the honour of Neptune, in imitation of Hercules, who had before instituted the Olympic games to the honour of Jupiter; but Archias refers their institution to the honour of Melicertes, or Palæmon, son of Athamas, king of Thebes, whom the Latins call Portumnus. Others say they were instituted by Nisus, son of Neptune; and others, by Sisyphus, brother of Athamas, king of Corinth, about 1326 years B.C. Others are of opinion that there were two distinct solemnities observed in the Isthmus, one in honour of Melicertes, and another in honour of Neptune.

The most probable account of the origin and subsequent renewal of these games, allowing, as it may perhaps be necessary, for some mixture of fable, is as follows: Athamas, king of the Orchomenians, a people of Bœotia, having divorced his former wife, named Nephelê, by whom he had two sons, Phryxus and Hellê, and having married Ino, by whom he had also two sons, Learchus and Melicertes, or Melicerta; the latter persecuted the children of the former marriage, so far as to make her husband believe that the oracle of Delphos demanded the blood of Phryxus, as the means of putting a stop to the famine of which the her-

self was the cause; and the too credulous Athamas was upon the point of sacrificing his son to the safety of his subjects; but upon information of his wife's whole management, he slew her son Learchus, and pursued Ino with such eagerness, that she was found to throw herself down with Melicerta, whom she held in her arms, from the top of the rock Moluria, into the sea. A dolphin, we are told; or rather the waves, carried Melicerta into the isthmus of Corinth; and the Corinthians, at the persuasion of Sisyphus, the brother of Athamas, after having given him a splendid funeral, instituted to his honour games, which obtained the name of Isthmian, from the place where they were celebrated for the first time. These games, in which were exhibited the same trials of skill as in the others, and chiefly those of music and poetry (see GAMES), having been interrupted, probably by some wars, were afterwards re-established by Theseus (1234 B.C.), who consecrated them to Neptune, whose son he pretended to be, as to the god who peculiarly presided over the isthmus of Corinth; and they were renewed so regularly every five years, about the middle of the month Hecatombion, that they were not even discontinued after the city of Corinth had been destroyed and reduced to ashes by Mummius (146 B.C.); the Sicyonians having received orders to celebrate them, notwithstanding the public grief and desolation. When the city was afterwards rebuilt, the new inhabitants resumed the care of these games, and continued to exhibit them with great regularity. Some time after, the Romans were admitted to them, and celebrated them with so much pomp and apparatus, that besides the ordinary exercises, a hunting match was there exhibited, in which were presented the most rare animals; the city of Corinth neglecting no means by which they might please their conquerors: and their fame was still increased, because they served as an era to the Corinthians, and inhabitants of the isthmus.

Archias and others say, the conqueror's prize at these games was a crown of parsley. Plutarch and Strabo say it was at first a crown of pine; and that this was afterwards changed for one of parsley; but that at length the pine was resumed; and to this was added a reward of 100 silver drachmæ, or about 3*l.* 4*s.* 7*d.* sterling.

These games were held, according to Pindar, every three years, or, according to Pliny, every five; and were so celebrated, and the concourse at them was so great, that only the prime persons of the most remarkable cities could have places in them. The Athenians had only as much room allotted them as the sail of a ship, which they sent yearly to Delos, could cover.

ISTHMUS, *Ισθμός*, in *Geography*, a narrow neck, or slip of ground, which joins two continents; or joins a peninsula to the terra firma, and separates two seas.

The most celebrated isthmuses are that of Panama or Darien, which joins North and South America; that of Suez, which connects Asia and Africa; that of Corinth, or Peloponnesus, in the Morca; that of Crim-Tartary, otherwise called Taurica Cherfoncus; that of the peninsula Romania and Erisso, or the isthmus of the Thracian Cherfoncus, twelve furlongs broad, being that which Xerxes undertook to cut through. The ancients had several designs of cutting the isthmus of Corinth, which is a rocky hillock, about ten miles over; but they were all vain, the invention of sluices not being then known. There have been attempts, too, for cutting the isthmus of Suez, to make a communication between the Red sea and the Mediterranean.

ISTHMUS.

ISTHMUS is also applied, by the anatomists, to several parts of the human body, particularly that narrow part of the throat, situate betwixt the two tonsils.

Also to the ridge that separates the two nostrils; and to the passage in that part of the medulla oblongata of the brain which lies between the cerebrum and cerebellum, and which reaches from the place called *anus* to the fourth ventricle. The upper part or cover of this conduit, or passage, which is betwixt the testes and the foremost vermicular process of the cerebellum, and to which two it is tied at its two ends, and to the processes which come from the cerebellum to the testes at its sides, is called *valenta major*; it is of a medullary substance, and its use is to keep the lymphia from falling out above the nerves in the basis of the skull.

ISTIATZKA, in *Geography*, a town of Russia, in the government of Tobolsk, on the Vagai; 68 miles S. of Tobolsk.

ISTIÆ, in *Ancient Geography*, a town of the island of Eubœa; situated in the northern part of the island upon a mountain, nearly opposite to the Pelægic gulf, which belonged to Thessaly. It was anciently called Oreos, from its situation, *oros* being a mountain. Its original inhabitants were driven from it by Pericles, and retired to the Eubiotide, an interior country of Thessaly; and their place was occupied by a colony of Athenians, of the tribe Hestieæ. It is now called Orio, or Oreo.

ISTIB, in *Geography*, a town of European Turkey, in Macedonia; 72 miles N. of Saloniki. N. lat. $41^{\circ} 50'$. E. long. $22^{\circ} 48'$.

ISTILLAR, a town of European Turkey, in Macedonia; 56 miles S.E. of Saloniki.

ISTIZER, a town of Russia, in the government of Tobolsk; 24 miles E.S.E. of Tobolsk.

ISTLAN, a town of Mexico, in the province of Mechoacan; 60 miles N.W. of Mechoacan.

ISTRE, a town of France, in the department of the mouths of the Rhone, and chief place of a canton, in the district of Aix; 18 miles S.E. of Arles. The place contains 2111, and the canton 5912 inhabitants, on a territory of $347\frac{1}{2}$ kilometres, in 4 communes.

ISTRIA, a peninsula of Europe, bounded every where by the sea, except on the north, where it is joined to Carniola. This peninsula was anciently a part of Illyrium; but being conquered by the Romans, between the first and second Punic wars, it was annexed to Italy. In the middle ages it belonged to the patriarch of Aquileia, who was invested with it, as a marquise, by the emperor Henry IV. In the year 1195 the maritime part was for the most part conquered by the republic of Venice, abating some interruptions on the part of the Austrians. Venetian Istria was divided into 4 bishoprics and 18 districts; it contained 6 large, and 12 small towns, or boroughs, 200 villages, and 100,000 inhabitants, who were chiefly employed in agriculture, the production of wine and oil, the rearing of bees, the manufacture of silk, leather, tallow, and salt, and fishing. The grain, wine, oil, and salt, have been reckoned excellent, and have afforded, together with the tunny fish and anchovy fishery, profitable articles of commerce. The marble and stone have likewise supplied important branches of trade. But the chief wealth of Istria has consisted in its forests, which overspread a great part of the country, and yield abundance, not only of fire-wood and timber for ship-building, but also of game. By the treaty of Campo Formio, in 1797, and that of Luneville, in 1801, the Venetian part of Istria was ceded to Austria. But by

the treaty of Pressburg, in 1805, that part of the states of the republic of Venice, which had been ceded to the emperor of Germany and Austria by the treaties of Campo Formio and Luneville, were united in perpetuity to the king of Italy.

ISTRUP, or **OISTRUP**, a town of the bishopric of Paderborn; 12 miles E. of Paderborn.

ISTUNALA, a town of South America, in the government of Tucuman; 130 miles E. of St. Miguel de Tucuman.

ISUNGO, a town near the centre of the island of Gilolo.

ISVORA, a town of Walachia; 12 miles E.S.E. of Brancovina.

ISURIUM, in *Ancient Geography*, a town of the island of Albion, or Britain, in the country of the Brigantes. It is now Aldburrow, near Boroughbridge, and probably derived its name from its situation on the river Ure. Although it is now a small village, it seems to have been once the capital of the Brigantes; being called, both in the Itinerary of Antonine and in Ravenna's, "Isurium Brigantum." The foundations of the ramparts may still be traced.

ISWARA, in *Hindoo Mythology*, one of the many names of Siva; but it is sometimes applied, rather confusedly, to other deities, being nearly equivalent to our lord, and susceptible of equivocal application. Generally, however, it is understood of Siva, and sometimes has the epithet *Mahab* prefixed, giving Maheswara, or the great Iswara. Under this form the name of his sakti, or consort, is Maheswari.

ISWETOSTA, in *Geography*, a town of Sweden, in the province of Skonen; 8 miles N.E. of Christianstätt.

ITABIER, a town of the island of Borneo; 30 miles N. of Negara.

ITABOCA, a town of Brazil, in the government of Para, on the Tocantin; 90 miles S. of Canuta.

ITACAMBIM, a town of Brazil; 60 miles N. of Villa Nova del Principe.

ITACORUSSA, a town of Brazil, situated on the Xingis; 60 miles S.W. of Curupa.

ITAIARA, in *Ichthyology*, a name by which some have called a Brazilian fish, of the turdus kind, of great beauty, and a very delicate taste, more usually known by the name *juruncapiba*.

ITAKA, in *Geography*, a town of Japan, in the island of Nippon; 35 miles S. of Ixo.

ITALA, a town of Sicily, in the valley of Demona; 13 miles S.W. of Messina.

ITALAH, a town of Asiatic Turkey, in Natolia. N. lat. $38^{\circ} 43'$. E. long. $28^{\circ} 29'$.

ITALIA, in *Ancient Geography*. See **ITALY**.

ITALIAN, the language spoken in Italy.

This tongue is derived principally from the Latin, and of all the languages formed from the Latin, there is none which carries with it more visible marks of its original than the Italian.

It is accounted one of the most perfect among the modern tongues. It is complained, indeed, that it has too many diminutives and superlatives, or rather augmentatives; but without any great reason: for if those words convey nothing farther to the mind than the just ideas of things, they are no more faulty than our pleonasm and hyperboles.

The language corresponds to the genius of the people; they are slow and thoughtful; and, accordingly, their language runs heavily, though smoothly; and many of their

words are lengthened out to a great degree. They have a great taste for music; and to gratify their passion this way, have altered abundance of their primitive words; leaving out consonants, taking in vowels, softening and lengthening out their terminations for the sake of the cadence.

Hence the language is rendered extremely musical, and succeeds better than any other in operas, and some parts of poetry; but it fails in strength and nervousness: hence also a great part of its words, borrowed from the Latin, become so far disguised, that they are not easily known again.

The multitude of sovereign states into which Italy is divided, has given rise to a great number of different dialects in that language; which, however, are all good in the place where they are used. The Tuscan is usually preferred to the other dialects, and the Roman pronunciation to that of the other cities; whence the Italian proverb, "*Lingua Toscana in bocca Romana.*"

The Italian is generally pretty well understood throughout Europe, and is frequently spoken in Germany, Poland, and Hungary. At Constantinople, in Greece, and in the ports of the Levant, the Italian is used as commonly as the language of the country; indeed in those places it is not spoken so pure as in Tuscany, but is corrupted with many of the proper words and idioms of the place; whence it takes a new name and is called *Frank Italian*. See LANGUAGE.

ITALIAN Coins, Measures, Marble, Silks. See the sub-
stantives.

ITALIAN School of Engraving. Engraving, with the work of the scoper occasionally intermingled with that of the graver, had been practised in Italy, from time immemorial, in ornamenting those golden and silver vases, chalices, and other vessels of plate, which adorned the communion-tables of the Catholic church, and the side-boards of the noble and opulent, when, about the middle of the fifteenth century, Mafo, or Thomafo, Finiguerra, a goldsmith of Florence, accidentally discovered the means of printing from the incisions thus sculptured on the metal: so that engraving on copper-plates, as it is now practised, with the view of rendering impressions on paper, is a scion from the decorative part of the art or trade of the goldsmith; but which has gradually far out-grown the parent tree.

Vafari, in his biography of Marc Antonio, has, with great propriety, connected his account of that distinguished engraver, with an history of the discovery which rendered his art so famous and so extensively beneficial. He says that Finiguerra, having performed an engraving on a piece of plate, and intending to fill up the hollows with enamel; in order to try the effect of it previously to putting on the enamel, cast some melted sulphur upon it, and, on taking it off, perceived that the dirt (or charcoal with which he first tried his work) collected at the bottom of the strokes, by adhering to the sulphur, gave an impression of what he had engraven. Struck with the discovery, he repeated the experiment, by applying moistened paper to his engraving instead of sulphur, rolling it gently with a roller, and this experiment being attended with success, he imparted his discovery to Baccio Baldini, who was also of Florence, by whom it was communicated to Sandro Boticelli, and perhaps also Antonio Pollajuolo, and Andrea Mantegna.

The baron Heinnekin, however, believes that rolling-press printing had previous existence in Germany, and subsequent writers (among whom is our countryman Strutt), giving credit to the opinion of an author, who is so generally worthy of it as Heinnekin, have copied this belief, or re-

peated this assertion of the baron, perhaps with too little reflection.

An accidental discovery of this kind, which might have taken place in any country where paper was known and used, reflects so little real honour upon its birth-place, as to be unworthy of half the importance which has been industriously endeavoured to be attached to it; yet for this trivial or fancied honour, the connoisseurs and literati of Italy and Germany have contended; and we must allow, that the mind of Heinnekin appears, in this instance, to have been influenced by an evident bias in favour of the pretensions of his country.

He opposes, however, only conjecture to the plain and simple fact of Vafari, which we have related above; and though he, as well as others, have sedulously sought for evidence in the dates of the earliest German engravings, no such evidence has been found. No German print impressed from an engraved plate, of which the date has not been subsequently altered to impose on the credulous, has been, or can be produced, as the present writer believes, bearing an earlier date than 1460, the year in which, according to Vafari, the accident happened in the workshop of Finiguerra, which gave to Europe the means of printing from the incision of the graver.

Finiguerra was born at Florence some time about the year 1424, and died in the same city at an advanced age. He is reported to have studied under Massaccio. Probably he learned drawing in the school of that master: and Baccio Bandinelli, in one of his letters says, that Mafo worked with Pollajuolo and other contemporary artists, on the far famed metal doors of the church of St. John at Florence. About the year 1450, he engraved also for the church of St. John, the Passion of Christ on a sacred vase of gold, in a very artist-like manner, though the figures were small. This fact is reported in a letter from M. Gabuori to Mariette; but of his other engravings we are compelled to speak with doubt.

Whether any impressions from the works of this artist remain to attest his discovery of printing, and corroborate the statement of Vafari, is at the best uncertain. Strutt has mentioned dubiously, "*The Seven Planets*;" which are really from the graver of Boticelli, and with better show of reason, a small plate of an artist engaged in his profession, which is marked with the letter F on a stone, and is certainly in the very earliest style (for Baldini and Boticelli can scarcely be said to have attained a style) of Italian engraving; to which the foreign writers on art have added the twenty-four following small engravings, which are, for the most part, of the circular form. According to Huber and Rost they were recognized as the work of Finiguerra by M. Otto, a well-known amateur of Leipzig, by M. l'Abbe Zani of Parma, and by the more celebrated baron de Stofsch, the latter of whom resided a long time at Florence, whilst he was forming his immense collection of works of art. All of these connoisseurs have admitted them into their collections as the work of Finiguerra; and Heinnekin, after attentive examination, has adjudged them to be his engraving and printing.

1. A couchant female, perhaps intended for a Venus. On a streamer surmounting the couch, is inscribed "*Amor vuol sé, o dove fé nonne.*" 2. The male and female supporters (a young man and woman) of the arms of the Medicis, with a vase of flowers, &c. The female is dressed in the Grecian taste, and holds two girdles. N. B. This seems to have been printed from the cover of a round box. 3. A half-length figure of a young man with a parroquet on his shoulder, playing the guitar, encircled by a border of fruit. 4. An adolescent cupid tied to a tree, his eyes bandaged,

bandaged, and four females tormenting him. 5. The same subject, differently treated. 6. Eight small ovals enclosed in a circular border of foliage. In the middle are two profiles of character, and in each of the rest a little cupid playing on some musical instrument. 7. A similar subject, except that in a circle in the middle, a cavalier and lady are represented dancing. 8. Another circle bordered with fruit. In the middle part, a bear in a landscape is attacked by five dogs, and at the top are two cartouches, on the scrolls of which the arms of the Medicis are traced with pen and ink. 9. Another circle, bordered with foliage. The subject a musical party, consisting of a cavalier and two ladies in a garden. 10. A monstrous visage, the mouth of which is extended by two hands, in a circular border. 11. Contains two profiles in medallion bordered with laurel; above them are three hunting subjects, in one of which a dog is attacking a stag, whilst a hare is escaping. 12. A lady caressing a unicorn. A dog is at her feet, and her head entwined with flowers. 13. Judith and Holofernes, in which the heroine is habited in the antique taste. 14. The same subject, except that Judith is here more richly dressed than in the former, and crowned. 15. A cavalier and lady walking in a cypress grove, whilst a youth plays the tambourine. 16. Jason and Medea, who appear as supporters to an armorial bearing. 17. Two supporters to a sphere: one of whom (the man) holds a streamer, on which is written "Amor vuol sé, a dove fé nonne;" the other is a female dressed in the antique taste, and holding the motto "Amor non pío." 18. Another heraldic subject, in the midst of which a circular space is left blank for an armorial bearing. The left supporter is a young lady, and on the right hand is a cavalier holding a wreath of laurel; a winged cupid is fluttering above, and beneath, a dog is asleep. 19. Another circular armorial bearing, with a male and a female supporter. 20. A guardian angel, with expanded wings in a pontifical habit. 21. Cupids holding wreaths of flowers and fruit; one with his eyes bandaged. 22. Bacchanals; in the midst of which is a car drawn by cupids, surmounted by a trophy of garlands throwing out fire. Some of the cupids are playing on instruments of music, others bearing flambeaux. The procession is led by one carrying a flag, on which is written "Purita," and closed by another, whose motto is "Al fecogedit." 23. Two women elegantly attired, sitting in a landscape, supporting a border of cornucopias. 24. Two warriors, with each a knee on the ground, supporting an octagonal escutcheon, on which is a female with her hands raised towards heaven. N. B. The four latter are ovals.

"An edition of the *"Inferno of Dante,"* printed at Florence in the year 1481, has long been supposed to contain the earliest Italian engravings, excepting the maps to an edition of Ptolemy printed at Rome in 1478, of which the date is ascertained, and to have been the first book ever embellished with copper-plate prints, in which human figures, or other natural objects, were attempted to be represented. This is, however, a mistake. The extensive and well chosen bibliographical collection of earl Spencer contains a more perfect book, printed also at Florence, (by Niccolò Lorenzo della Magna,) but in the year 1477, which is four years anterior to the *"Dante."* Its title is *"Monte Santo di Dio;"* its author Antonio Bettini, bishop of Fuligno; and of the three engravings it contains, one is much larger than the embellishments of Dante.

"The prints that accompany both these books are the joint performance of Baccio Baldini and Alessandro Boticello, or Boticelli; and none of them discover much skill either in the design or execution. The same artists have also engraven a

set of the Prophets, single figures; and a much larger plate than had yet appeared in Italy, of which the subject is *"The Last Judgment,"* and where the damned are represented in separate places of torment, which resemble ovens, each inscribed with a particular vice or mortal sin. But it must be added, that all the engravings which these artists performed in conjunction, are Gothic, vulgar, and inferior to those of their German contemporaries."

Baldini was a Florentine by birth, and was brought up to the business of a goldsmith. Judging from his engraving, and his obscurity in every other respect, he seems to have been one of those men of slender talent, who are pretty numerous in all times and places; whose mere want of employment affords them leisure to catch at, and avail themselves of the advantages of, the inventions and discoveries of others. From Finiguerra he obtained his method of printing; and Boticelli furnishing him with designs, he engraved, with the help of the latter, nineteen plates for the above-mentioned edition of the *"Inferno of Dante."* The whole of his other engravings, with which we are acquainted, have been already mentioned.

Sandro Boticelli, surnamed Filippini, goldsmith, painter, designer, and engraver, was born at Florence in the year 1437, and died in the same city in 1515. Though apprenticed to a goldsmith, he studied the art under Filippo Lippi the painter, and acquired some reputation by his pictures, but more by his drawings. His biographers say, that he learned engraving (probably printing by means of the roller) of Finiguerra; and beside the designs for Dante's poem, and those which follow, Vasari mentions with distinction, as his very best performance with the graver, a print, entitled *"Le Triomphe de la Foi de Fra Girolamo Savonarola."*

"St. Jerome on his Knees, extending his right Hand toward a Crucifix;" "St. Sebastian with the Virgin Mary," inscribed "O Mater Dei, memento mei—O beate Zebastianus;" a set of twelve of *"The Sybils,"* with each a scroll, and eight Italian verses beneath; *"The seven Planets."* (N.B. It is one of them, namely, the planet Venus, which Strutt has copied, and ascribed to Finiguerra.) *"The Triumph of Paulus Emilius,"* inscribed on a medallion, *"Paulo Emilio Aug.;"* a set of the *"Vices"* and *"Passions,"* with *"Innocence"* and *"Truth;"* *"The glorified Saviour rising in Judgment, attended by the Prophets and Saints."* The three latter are of small folio dimensions; and of the last of all we have already particularly spoken under the title of *"The Last Judgment,"* the joint production of Boticelli and Baldini.

"Antonio Pollajuolo or Pollajuoli, who was also of Florence, and born some time about the year 1426, may with more propriety be called an artist. From the antique sculpture, which was now beginning to re-appear, he seems to have learned attention to the anatomy of his figures: to which most important requisite of historical art, Pollajuolo has the distinguished honour of having been the first to attract critical attention. He has shewn his predilection for this study, by representing the conspirators naked in the medal which he cut to commemorate the assassination of Julian, and the attack on Lorenzo de Medici; and also in a much larger engraving than had hitherto been executed, of which the subject is a battle, and wherein he has represented all the combatants naked. There is an impression of this very scarce print in the Cracherodean collection, printed on reddish paper: each figure is nearly eleven inches in height; the heads have some faint dawnings of expression; and the shadows are produced without crossings, by diagonal lines, apparently done to imitate the hatchings of a pen, and in the same direction in which it is customary to write:

write: but the outlines and shadows are dry and hard, and the forms vulgar and heavy. It is only by comparing Pollajuolo with his contemporaries and predecessors, that we learn to respect his performances; and it has even been said of his most celebrated work, ("The Martyrdom of St. Sebastian,") that it "exhibits only a group of half naked and vulgar wretches discharging their arrows at a miserable fellow-creature, who, by changing places with one of his murderers, might with equal propriety become a murderer himself:" so little attention was paid even in Italy, at this early period, to character and expression." Landseer's Lectures.

Like most of the contemporary artists of his country, Pollajuoli practised occasionally the several branches of imitative art, which have since become distinct professions, and was at once goldsmith, medallist, sculptor in relief, painter, and engraver with the burin. Bartolucci was his principal, or at least his first instructor; but he worked with considerable credit, under Ghiberti, on the justly celebrated metal doors of the church of St. John at Florence. He also executed the monument of pope Sixtus IV., which originally stood in the chapel of that name, and has since been removed by the order of Urban VIII. to the church of St. Peter; and that of Innocent VIII.; which are both in bronze, and are works of great merit. The plan of the Belvedere palace has been likewise attributed to him.

Of the prints now extant from the graver of Pollajuoli, we know only of the following:

The above-mentioned large folio, wherein six men are represented fighting with swords in a forest; an "Holy Family," also in folio; and two smaller prints of "The Labours of Hercules," in one of which he is engaged with Antæus, and in the other removing a column.

An obscure village near Mantua gave birth to the chevalier Andrea Mantegna, in the year 1451. Born in indigence, he was obliged in his early youth to tend sheep for a subsistence; but being gifted by nature with a happy genius for the imitative arts, he employed all his leisure in endeavouring to draw the objects around him. F. Squarcione, that observant protector of the fine arts, who was thence surnamed the Father of Painters, discovering the disposition of our young shepherd for painting, took charge of his education; and conceiving for him an ardent affection, which increased with the increasing merit of Mantegna, finally created him heir to his fortune.

Mantegna married the daughter of John Bellino of Venice. Correggio became his disciple, and the duke of Mantua his warm admirer and patron: from his hands our artist received the honour of knighthood; and for him he painted that celebrated picture, which he afterwards engraved, and which is now in the royal palace at Hampton-Court, of the "Triumph of Julius Cæsar."

He executed several great works for pope Innocent VIII., who invited him for that purpose to Rome. He painted an altar-piece for the church of St. Sophia of Padua; and several pictures for that of St. Justinian, particularly one which has been much admired for its colouring as well as design, in a chapel belonging to that church: finally, he died in the same city (of Padua), highly honoured and admired, in the year 1517; and a tomb, surmounted by his bust, was raised to his memory in the church of St. Andrew.

Mantegna contributed much to the advancement of Italian engraving. "By his more intimate knowledge of the antique, and his superior use of that knowledge, he improved the drawing, without materially altering the style of engraving of Pollajuolo, by whom he is presumed to have been instructed in the new art. Indeed, as the local energies and

practical perfections of painting were at this time so imperfectly developed, it was much more natural, and in the same degree more wise, for engraving to imitate pen and ink drawings than to imitate pictures; and the best of Mantegna's prints derive a peculiarity of character and of value from this circumstance. By intermingling the appearance of the finer strokes of the pen, as it worked upward, in his shadows he softened and mellowed the stronger lines; so that the whole became a more appropriate vehicle of the obscurity he had in view: and the exact similarity of his style of engraving to his own mode of drawing sufficiently shews, that to imitate pen and ink drawings was the boundary of his aim.

"A very curious pen and ink drawing from the hand of Mantegna, of which the subject is an attempt to restore an allegorical picture which Apelles painted from an event in his own life, is now in the possession of Mr. West, president of the Royal Academy. He engraved, from his own designs, sometimes on copper, and sometimes, as it is said, upon tin. "In his engravings, as in his pictures, his contours are of a grand and decided character, sustained throughout by much of what has since been termed the noble simplicity of the Roman school. His prints are not few; but considering the early period at which they were performed, are much more extraordinary than numerous. The two "Labours of Hercules," in the Cracherodian Collection, ought probably to be reckoned among the earliest of Mantegna's engravings. Like those of Pollajuoli, they are printed on reddish paper, and are designed in the same heavy style. His "Bacchanalian Procession" has still some considerable remains of Gothic grossness; but he has here shewn his talent in composition, and the fore-shortenings that occur are far better expressed than we have hitherto seen. The composition of his "Battle of Sea-Gods and Tritons" is wildly grand, with such a mixture of the grotesque, as may seem not improperly to belong to a subject which we should esteem out of nature, or beyond the limits of the material world. The combatants in this battle are the offspring of his own fertile and vigorous fancy, generated by the sculpture of antiquity. Beside the tritons and sea-monsters, here are the general forms of horses and men; but, like the fawns and sylvan deities of the Greeks, their natures partake of the element in which they exist:—at least, the spectator is led to perceive that this intention existed in the mind of the artist, and that (in the words of Ariel's song) they have undergone "a sea-change, into something rich and strange." Instead of hair, sea-weed decorates the human heads; and the fins and scales of marine animals help to constitute the horses and tritons. Their weapons, too, are congenial with themselves; they fight with fish and fish-bones, and the skull of some unknown inhabitant of the deep serves as a shield.

"The heads of the horses, as well as those of the sea-gods, are animated by no inconsiderable portion of the ideal grandeur of the antique; the anatomical markings, the constant object of Mantegna's attention, are also successfully studied from the same inestimable source of information: and in the early impressions, the chiaroscuro has more breadth, as well as depth, than seems to belong to the Italian art of this early period, and is conducted through the whole with masterly address.

"A more slow and sedate magnificence moves his triumphal procession of Julius Cæsar. The wild imagination which revels in his recesses of the ocean, and his bacchanalian processions, is nearly excluded from hence; it but serves, in the flaming of the candelabra, to gleam through "the spoils of nations, and the pomp of wars;" or faintly

discovers itself in other subordinate accessories as the fringed ornament of stately grandeur.

"In his Dance of females, he has shewn so much of the graceful simplicity and general air of Greek sculpture, as to give rise to a belief that it has been copied from an antique basso-relievo: but till such a basso-relievo is shewn, it would be unfair in us to resign so much of the merit of Andrea Mantegna as this composition may claim. These three engravings abundantly demonstrate the wide range of his technical and inventive powers; and shew with what success he could combine, or separately exhibit, elegance, wildness, and grandeur, as occasion admitted or required.

"Some critics have thought that Mantegna's admiration of the antique was too predominant in his works; that it too frequently engrossed his powers; and hurried him too entirely away from that contemplation of nature, which must always be one of the parents of originality in art. Yet, if this enthusiasm be a fault, it is a fault proceeding so necessarily, and so immediately, from the localities of time and place, and the redundancy of his merits, that it is as secure of pardon from the candid, as those merits are of praise." Landseer's Lectures.

The monogram of this celebrated engraver, resembling that of Marc Antonio, will be found in our *Plate I.* of those of the *Italian School.* The following list is believed to contain all his principal works, and it is not certain that he engraved any more than this list contains. They are of folio dimensions, and some of them very large:—"The Madonna and Infant Christ," (copied by Strutt in his *Biographical Dictionary of Engravers*); "The Choice of Hercules;" "Hercules overcoming Antæus," inscribed "Divo Herculi invicto;" "The Marriage of Eneas with Lavinia;" "The Scourging of Christ;" "The Entombing of Christ," inscribed "Humani generis Redemptor;" "The Descent of the Saviour to Hell;" "The Resurrection of Jesus Christ;" "Judith with the Head of Holofernes;" and two grotesque monsters fighting in the presence of two warriors.

The following are the principal subjects of M. Landseer's comments which are quoted above:—"A Bacchanalian Procession," in which both fawns and satyrs are introduced; "A Battle between various marine Monsters;" "A Dance of Four Females;" "The Triumph of Julius Cæsar," engraven on nine plates, which, when joined, form a magnificent frieze: but it is uncommon to find a collection where the nine are complete.

Giovanni Maria da Brescia, or Brixienfis, was a native of Brescia, in the Venetian territory, and was born A.D. 1460. He was an ecclesiastic of the order of Carmelites, and about the beginning of the sixteenth century, painted "The History of Elisha and Elijah" for the monastery to which he belonged. He also practised goldsmithery; but it is his engravings, which are somewhat numerous, that are the proper subject of our present notice.

The style of his manual execution is not always alike. In some of his prints it is evidently formed on that of Andrea Mantegna, the lines which form the shadows being laid from one corner of the plate toward the other, without any cross hatchings, somewhat neater than those of his great exemplar, but very inferior to him in every other respect. On other occasions he employed second courses of lines, but his drawing is heavy, and his extremities not well marked: yet his prints, of which the principal are entitled as follows, are much sought after by the curious:—"The Virgin Mary seated on a Bench with a Book in her right Hand, holding the Infant Christ;" "The Virgin seated upon Clouds with the Infant Christ; St. John Baptist, St. Jerome, and three Carmelite Friars below," dated 1502; "The Miracle of St. Gregory restoring a Boy to

Life." It is a large folio of thirteen inches by nine, and is inscribed "Opus fr̃is io Mariæ Brixienfis, or Carmelitarum. MCCCCII." The manual part of the engraving of this plate is in a mixed style between those of Mantegna and Marc Antonio. "The History of the Emperor Trajan," wherein the artist has complimented the reigning pope, by introducing him at a balcony above.

Giovanni Antonio da Brescia, the brother of the preceding artist, was born at Brescia some time about the year 1461, and also became a Carmelite friar. He applied more closely to engraving than Giovanni Maria, and studied the works of Mantegna with somewhat better success. Yet his outline is poor, though his manual execution is sufficiently clear and neat. We have subjoined a list of his most esteemed works, of which the best appear to be copies from Andrea Mantegna:—"Hercules vanquishing the Nemean Lion," after Andrea Mantegna, inscribed "D. Here in victo;" two plates of "Hercules" and "Antæus," after the same master, one of them an upright 4to.; "A White Horse," resembling that by Albert Durer, except in the back ground, a small upright; "The Scourging of Christ," a large upright. Of these the earliest and best impressions are dated 1503, and a second edition was printed in 1509. "The Virgin and Child;" "The Holy Family, with St. Joseph asleep;" two plates of a "Satyr and Female," inscribed "Victoria Augusta," on a tablet; "A naked Female reposing with an Infant, while a Satyr is playing on a Pipe."

Hieronymus Mocetus, or Jerome Mocetto, engraved both on metal and on wood, and was born at Verona in the year 1454. Strutt's account of him is as follows:—"The prints by this ancient master are by no means common. He worked with the graver only; but did not excel in the management of that instrument. His style of engraving bears some resemblance to that of Robella. Though it is considerably neater and clearer, he did not draw the naked parts of the human figure correctly. The extremities especially are very defective. The study of the chiaro-scuro was at this time very little attended to. We must not wonder, therefore, at finding the works of this artist totally destitute of effect. However, they are not without merit; though, it must be confessed, that their scarcity stamps the greatest value on them. We have by him, "The Resurrection of Christ, with Four Soldiers at the Foot of the Tomb," apparently from his own design; "A Sacrifice," with many figures, from an antique bas-relief; a middling-sized plate, lengthways. Also several battles, with other subjects; which are variously marked, as may be seen in our *Plate I.* of the monograms, &c. of the *Italian School of Engravers.*

Nicoletta, or Nicolas da Modena, was a native of Modena, and seems to have studied architecture and perspective with more assiduity than success. He is ranked as one of the earliest engravers of the school of Lombardy; and, when we examine his works, it seems as if the name of engraving only had reached him; and that he had been obliged to work out his own system. It is astonishing, at a time when so many engravers of consequence were living, and had produced such a variety of excellent prints, especially Marc Antonio and his scholars, that this man, who was himself a painter, should have been so much at a loss, not only in the mechanical part of the execution of his plates, but with respect to the compositions and drawing of them also. If these rude productions have any merit to recommend them, it must consist in the buildings and architectural ornaments, which he introduced into his designs, and with which he has frequently crowded them in a very absurd manner: he worked with the graver only; and his

largest plates seldom exceeded the common folio size. He usually signed his name at length; but, in some few instances, he used the two monograms which we have copied in our *Plate I.* of those of the *Italian School*. We have engraved by him, "The Adoration of the Shepherds," a middling-sized upright plate, marked with his name at length; "St. Sebastian," a middling-sized upright plate, marked with his baptismal name; "Nicoletto," on a tablet; another "St. Sebastian," inscribed with his monogram; "St. Jerome;" "St. George;" "St. Martin;" "A Triton embracing a Syren;" beside other works of less repute.

Benedetto Montagna, was born at Venice some time about the year 1458, and died at Verona in 1530. He engraved on copper, and the graver was the sole instrument of his art. His engravings are dated from a very early period of the art in Italy, and it is more than possible that the prints of Albert Durer, which were brought to Venice as an article both of taste and commerce, and those of Marc Antonio, who had now been following the profession of engraving for some time in that city, might induce him to take up the novel art either as a matter of profit or of curiosity. The efforts of Montagna, however, are but feeble; his outline is exceedingly defective, and his manual execution harsh and rude, though in some few instances he attempted to assist the blending of his lights and half-tints by means of stippling.

Benedetto engraved from his own compositions; and the resemblance which some of his prints bear to the earliest and rudest productions of Marc Antonio, of which we shall presently speak, may well be thought to strengthen our supposition, that from them he learned the rudiments of the art. His engravings, of which the following will probably be found the best, are very rare, and are generally, if not in every instance, marked with his name at length:—"An Holy Family," in which the Virgin Mary appears seated, holding the Infant Christ: St. John is standing beside her naked, and St. Joseph appears below. A view of a town, with a river and bridge over it, constitutes the background: at the top is the artist's name. "The Judgment of Midas," a small upright. A naked figure standing by a tree, somewhat larger. An elderly man and a youth; the former playing on the bag-pipes, the latter upon the violin. A landscape, with a hamlet in view, and an old man seated on a bank, both small uprights. Another landscape, with three women on the foreground. A young man sitting on a rock, passing a cord round a palm tree. "The Rape of Europa." "Venus chastising Cupid."

Strutt says, that Rubetta, or H. Robetta, flourished in 1610. This is evidently a mistake. The French writers on art, with much more probability, say that he was born at Florence in the year 1460; but the events of his life are very obscure, and his engravings of no value but from their antiquity and rarity, for they are wretchedly executed. The subjects of most of them are devotional, and he sometimes affixed his name at length, and at others the initial letters R.B.T.A. on a little tablet.

His most esteemed engravings are, "Adam and Eve," a small upright folio; "The Adoration of the Magi," of a nearly square form; "The Resurrection of Jesus Christ," a small upright folio; and "The Golden Age," a large upright folio.

Titian also etched some plates about this time, probably in the way of recreation, and it is said, performed some engravings on wood. Among the former are several large landscapes from his own compositions, the subject of the most remarkable of which is a pastoral, where a shepherd is playing on a flute, before his flock, by the side of a stream. In another a traveller is sleeping by moonlight. He like-

wife etched an allegorical print of Death habited in the armour of a knight.

The most remarkable of his wood-cuts, if these are really by the hand of Titian, which appears very doubtful, are, "The Marriage of St. Catherine," a large upright, executed in a slight but masterly manner, and inscribed "Titianus Vecellius Inventor Lineavit." "The Triumph of Faith," represented by a procession of patriarchs, prophets, evangelists, apostles, saints, martyrs, preceding and following Jesus Christ: it is composed of from eight to ten prints, forming, when pasted together, a very long frieze, and dated 1505. "The Destruction of Pharaoh and his Host," a very large print lengthways, composed of six parts. This is very rough and rudely cut, and by no means equal to the "Triumph of Faith," which is a very masterly performance. "Sampson betrayed by Dalilah." "The Deluge," a larger engraving, printed on two sheets, of which Papillon says, that it is very correct and admirable; but Strutt, (who had seen the print) very properly observes, that this boasted precision seems to make against its being from the graver of Titian, who would scarcely have bestowed so much time and labour as must have been required to complete it in so neat and regular a manner.

The famous satirical engraving of an old ape and two young monkeys, in the attitudes of Laocoon and his sons, which was long ascribed to Titian, is now known to be the performance of Nicolo Vicentino. It was done to satirize Baccio Bandinelli, who boasted of having executed a Laocoon, which was superior to the antique.

But Strutt thinks, and with great appearance of probability, that most, if not all of the wood engravings ascribed to Titian, are really the work of his younger brother Cesare Vecelli, who also produced a set of 8vo. prints, executed in a very spirited and masterly style, from the designs of Titian, of ancient and modern dresses, which was published at Venice in 1590; but perhaps there had been a former edition. The title of the edition of 1590 runs thus, "Degli Habite Antichi et Moderni di diverse parte del mondo, Libri due fatti da Cesare Vecellio;" and in a subsequent edition, published in 1664, it is more fully expressed as follows: "Raccolta di figure delineate dal gran Titiano, e da Cesare Vecellio suo Fratello diligentemente intagliate."

A single print in chiaro-scuro, serves to mark the talent, in that mode of engraving, of Baldassare Peruzzi, an extraordinary architect, painter, engraver, and antiquary of this period. He is generally supposed to have been a native of Sienna, but Vasari says, and probably with truth, that he was born at Volterra, in the year 1481. Beside building churches and palaces at Sienna, and other parts of Italy, he embellished them with his pictures; and wrote a treatise on the antiquities of Rome. He left behind him a commentary on Vitruvius, which Papillon informs us he intended, but that the hand of death prevented him, to have illustrated with engravings on wood. It is reported, but we cannot say on what foundation, that he was poisoned by some artist who envied his superior talents.

The print to which we have alluded is an upright folio, representing Apollo, Minerva, and the Muses, with Hercules expelling Avarice from their presence. It appears to be engraved on three blocks; one for the outlines, another for the half-tint, and a third for the deeper shadows. It is executed in a bold and spirited style, and inscribed "Bal. Sen," over which letters is a five-pointed star.

Domenico Campagnola was born at Padua A.D. 1482. He was the son of Jerome Campagnola, the sculptor, and the disciple of Titian. He chiefly excelled in landscape, and has produced a considerable number of prints, some of which are

are etchings and others engravings on wood, executed in a bold style, but very slight, and incorrect in his drawing of the naked. He died at Venice in the year 1550, but lies interred in the church of St. Anthony of Padua, near the tombs of his ancestors.

Of his etchings the following are the principal:—"The Adoration of the Magi and Kings," a grand composition, in folio; "Cæsar's Tribute Money;" "Our Saviour healing the Sick;" "The Parable of Dives and Lazarus," in large folio, etched on three plates, and marked "D.C. In Luca Bertelli," &c.; "The Gift of Languages, or Descent

of the Holy Ghost," a large circle, inscribed "D O
CAP 1515;"

"The Holy Family, with St. Jerome and St. John," after Titian, a large folio, dated 1517. Two circular prints, one of which is "The Decollation of a Female Martyr;" "A Group of Warriors, attended by Fortune, stopping the Progress of the Arts and Sciences." A landscape, with Jupiter and Calisto, after Titian. Another landscape, on the fore-ground of which is a chariot drawn by two bulls; marked D. C.; a bacchanalian subject; a Venus, inscribed "D.O. Camp. 1517."

The most esteemed of his letter press engravings are "The Holy Family," in a landscape, with St. John and other saints. The Virgin Mother is represented suckling the Infant Christ; a folio print. A grand landscape, in which is introduced St. Jerome. Another large landscape, with a soldier and his family. Three children near a pedestal, one of whom is contemplating a dog gnawing a bone. "The Massacre of the Innocents;" and "The Destruction of Pharaoh and his Host," a large and grand work engraved on twelve blocks after Titian, and marked "Domenico del Greco 1549."

According to the testimony of the author of the *Abece-dario*, Julio Campagnola, surnamed Antenorius, was the brother of Domenico; Florent le Comte says, that he flourished, as an engraver, from 1507 to 1517. He worked entirely with the graver, but in two very different styles, one of which was his own invention.

The only two prints by Julio, with which we are acquainted, exemplify this remarkable variation in his style. The first is a small upright of "The Rape of Ganymede;" the execution of which resembles, in the manual, that of Marc Antonio, though the drawing is very inferior. It is inscribed "Julio Campagnola Antenorius fec.;" the other is somewhat larger, and represents St. John standing, holding a cup and looking upwards. In this plate he has entirely departed from his former manner. The background is executed with round dots, made apparently with a dry point. The figure is outlined with a stroke deeply engraved, and finished with dots, in a manner somewhat resembling those prints which Demarteau engraved at Paris, in imitation of red chalk. The hair and beard are expressed by strokes. It is a very extraordinary print, and proves the antiquity of that mode of engraving, which has been erroneously considered as a modern invention; but its merit consists chiefly in its singularity; for the drawing of the figure is stiff and incorrect, and there is nothing in the general effect to recommend it.

About the time now under our consideration, there arose in Europe another new mode of engraving, which successfully imitated drawings washed with bistre, or those ancient Greek pictures which were called monochroms by the ancients. Mr. Landseer says, that "the title of engraving in *chiaroscuro*, was at that time exclusively, and therefore improperly applied to this new mode of art," since

chiaroscuro, or effect of light and shade, is a necessary and elementary part of every mode of engraving that goes beyond a mere outline.

The invention of prints in *chiaroscuro* is claimed both by the Germans and Italians. The latter assert that soon after the commencement of the sixteenth century, Ugo da Carpi, a man of great ingenuity, discovered a mode of imitating slight drawings by the means of different blocks of wood. The Germans, on the other hand, produce several engravings by Mair, which are dated 1499, and one by Lucas Cranach, dated 1500, which are prior to the time affixed by the Italians for the invention by Da Carpi. This circumstance, even if we should suppose that the prints by Mair are the first attempts in this style of engraving, is sufficient to prove the priority of the exercise of it in Germany. Baron Heinnekin is of opinion that the *chiaroscuros* of John Ulric are still more ancient than those by Mair.

There is, however, a material difference between the *chiaroscuros* of the old German masters, and those of the Italians. Mair and Cranach engraved the outlines and deep shadows upon the copper. The impression taken in this state was tinted over by the means of a single block of wood, with those parts hollowed out which were designed to be left quite white upon the print. On the contrary, the mode of engraving adopted by Ugo da Carpi, was to cut the outlines on one block of wood; the dark shadows upon a second; and the light shadows, or half tint, upon a third. The first being impressed upon the paper, the outlines only appeared; this block being taken away, the second was put in its place, their coincidence being secured by a mechanical contrivance, and being also impressed upon the paper, the dark shadows were added to the outlines, and the third block being put in the same place, upon the removal of the second, and also impressed upon the same paper, made the demi-tints, and the print was completed. In some few instances, the number of blocks were increased, but the operation was still the same, the print received an impression from every block.

Da Carpi, who first practised this mode of art in Italy, was born at Rome in the year 1486. He studied painting with his great contemporary Raphael, but appears to have possessed one of those minds which, in all ages, bear hard upon rectitude, by preferring novelty to established principle. He painted an altar piece for the church of St. Regard, in the execution of which he used no pencil, but laid on the colours immediately with his fingers; Michael Angelo being importuned for his opinion of this work, simply replied that "it would have been better had he used his pencils."

It is probable that his passion for novelty led him to practise that new mode of engraving on wood, which is now under our notice, which also calling into action his acquired talents as an artist, enabled him to produce those masterly and spirited imitations of the sketches of the great painters, from whose works they are taken, which he sometimes printed in green, sometimes in brown, and sometimes in other colours, as his love of novelty and experiment directed.

Of these works, those which are most sought after by the curious, are as follow:—"A Sybil with Tablets and a Stylus, with an Infant Genius holding a Torch," after Raphael, printed in green, and, according to Vafari, the first work of the kind produced by Da Carpi. "Eneas escaping from Troy with his Father Anchises," a large upright, from the same master. "The Descent from the Cross," an upright folio; "David beheading Goliath;" "The Slaughter of the Innocents;" "Jesus preaching in the Temple;" "Elymas stricken with Blindness;" "The Death of Ananias;" "St. John in the Desert;" "A Dead Christ on the Knees of his Mother;" and "Raphael conversing

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versing with his Mistress;" are all after the works of this great painter.

After Parmegiano, he has engraven, a philosopher seated, with a book open before him, and in the back ground, to the right, a bird, with its feathers plucked off; probably intended for Diogenes, and the cock which he plucked in ridicule of Plato's definition of man. This is a large and curious folio print, some of the impressions of which are printed in four different colours. "The Holy Virgin, with St. Sebastian, and St. Nicholas." "A Satyr fathoming Water with his Flute." All of these prints are of folio dimensions.

Dominico Micarino of Sienna, surnamed Beccafumi, was born at Sienna, or in some neighbouring village, in the year 1484, and died in 1549 in the same city, which, by his various works in sculpture, architecture, painting, and engraving, he greatly contributed to adorn. He was of poor parents, and like Andrea Mantegna, passed the early years of his life in keeping sheep. His family name was Micarino; but signor Beccafumi, a discerning citizen of Sienna, observing him busied in tracing forms upon the sand with his crook, conceived a favourable opinion of his natural abilities, and raised him from obscurity.

From this kind patron, who successively placed our young artist under Antonio Verelli, and Pietro Perugino, he took the name of Beccafumi. He travelled to Rome to compleat his studies from the works of Raphael and Michael Angelo; after which he returned to Sienna, where he was employed in several works both in fresco and oil, which acquired him great applause, but nothing contributed more to the establishment of his reputation than the mosaic pavement with which he ornamented the cathedral of Sienna.

Micarino appears to have worked occasionally in all the modes of engraving which had then been invented. He was a very good engraver on wood, and particularly excelled in chiaro-scuro, sometimes working from his own designs, and at others from those of Titian and other masters. He also etched several plates in a very spirited style, and we have some few prints executed by him with the graver only. In these the hand of the master is very evident; the figures are drawn in a spirited style, and the extremities are finely marked, but, from want of skill in the management of the point and the graver, the mechanical part of the work has a harsh and unpleasant appearance to an eye accustomed to neatness and precision.

His engravings, of which the following list specifies the principal, are sometimes marked with his name at length, and at others with the cypher which will be found in our *Plate I.* of those of the *Italian School*.—A large folio print of "The Nativity," after Titian, cut in wood in a very spirited manner. "The Holy Virgin embracing the Infant Christ," printed in chiaro-scuro, in three colours, and probably from his own composition. Four prints executed in the same manner of "St. Peter," "St. Philip," "St. Andrew," and "St. Jerome." "A Philosopher sitting wrapt in his Mantle." Portrait of pope Paul III. Three engravings on copper, of which the subjects are groups of academy figures; and ten engravings on wood of alchemical subjects.

The next engraver of decided talent that Italy produced was Marc Antonio Raimondi, whose name marks a memorable era in the history of engraving. He was born at Bologna in the year 1487 or 88, and died in the same city about the year 1539. Like many of his contemporaries and predecessors, he was brought up to the business of a goldsmith, but studied drawing, in which he so much excelled under Francesco Raibolini, surnamed Francia, from his attachment to whom, Raimondi himself obtained the cognomen of

Francia. His earliest prints, as far as is known, were "The four Heroes," and "Pyramus and Thisbe," the latter of which is dated in the year 1502, when he could have been only 14 or 15 years of age; these early works are both engraved after the designs of this master, and the letter F, which forms part of the monogram, affixed to them, may be supposed to stand for either Francia or fecit.

Our artist, however, is now generally known by his baptismal names, Marc Antonio. Being eager for improvement in his art, he travelled to Venice, where he first met with the works of the German engravers, particularly a set of wood cuts by Albert Dürer, representing "The Life and Passion of our Saviour." These pleased him so much, that he purchased them, though they cost him nearly all the money he had brought with him; and he copied them with great exactness on copper. The deception, it seems, answered well to Marc Antonio; for, we are told by Vafari, that they were frequently sold for the originals. This circumstance, according to the same author, coming at last to the ears of Albert Dürer, he complained to the senate of Venice of the injury which he had sustained, but all the redress he could obtain was, that Marc Antonio should not, for the future, add the cypher or monogram of Albert Dürer to any of the copies he might make from his engravings. This story, if true, is not without its difficulties, and one of the most striking is, that the copies which Marc Antonio made from the Life and Passion of Christ, by Albert Dürer, have not the mark of that artist at all upon them, but the cypher of Marc Antonio only. Vafari indeed might have mistaken the life of Christ for the life of the Virgin, by Albert Dürer, because Marc Antonio copied them both with equal precision. The latter are much larger than the former, and have the monogram of Albert Dürer represented in the same manner as upon the originals; and to these Marc Antonio has not put his own cypher, except upon the last plate; but even that has the monogram of Albert Dürer also. Of course, these prints will much better agree with the story above related, than those mentioned by Vafari.

When Marc Antonio quitted Venice, he went to Rome, where his merit soon recommended him to the notice of Raphael, who not only employed him to engrave a considerable number of his designs, but formed an intimate friendship with him, and it has been said, though without sufficient authority, that he assisted him in tracing and correcting the outlines upon the plates.

The first plate he engraved from a drawing of Raphael's was, "Lucretia stabbing herself," in which he seems to have exerted all his abilities to make it neat and delicate. Soon afterwards he executed the plate of "The Judgment of Paris," which, though not so neat as the former, has more freedom and spirit. Raphael himself was so perfectly well pleased with the works of this admirable engraver, that he sent many specimens of them, as a complimentary present, to Albert Dürer, which he thought well worthy of his acceptance.

The great reputation which Marc Antonio acquired under the patronage of Raphael, brought many young Italian artists to Rome, in order to study under him; and among them were the following: Agostino de Musis, Marc de Ravenna, Giulio Bonafoni, Niccolo Beatrici, and Enea Vico, who all of them became his pupils, and as his name began to be known abroad, Bartolomeo Beham, George Penz, and James Binek, with others, natives of Germany, came into Italy, and frequented his school. For engraving some plates after the designs of Julio Romano, of which the subjects are taken from the lewd sonnets of Arctin, he was committed to prison by pope Clement VII., but recovered his freedom through the interest of Baccio Bandinelli.

After.

After his release, Marc Antonio, to manifest his gratitude to Bandinelli, engraved, from a picture of his, that admirable print representing the Martyrdom of St. Lawrence; and succeeded so happily, correcting carefully several faults which were in the picture, that the pope, who was a great lover of the arts, upon seeing an impression from the plate, pardoned his offence entirely, and took him under his protection. We now see our artist in the zenith of his good fortune; but his decline was still more sudden than his advancement: for the city of Rome being taken by the Spaniards, A.D. 1527, Marc Antonio lost in the pillage all the wealth he had accumulated. He retired afterwards to Bologna, where perhaps he died; but of this there is no certain account. The last dated print we have by him is, "The Battle of the Lapithæ," engraved in 1539; after which time, we hear no more of him, or of his works. Malvasia indeed affirms, that he was assassinated by a nobleman of Rome; because he had, contrary to his engagement, engraved a second plate of the Murder of the Innocents, after a design of Raphael. This design was certainly twice engraved by Marc Antonio, with very small variations, as will be mentioned below. Balducci, following Malvasia, mentions this story; and adds, that Marc Antonio was married, and that his wife was also an engraver. But the total silence of Vafari as to this circumstance, renders it exceedingly doubtful.

The style and the principal works of so distinguished an artist, the founder of the Roman school of engraving, call for particular comment. In his fifth lecture, delivered at the Royal Institution, Mr. Landseer says, "The style of Marc Antonio possesses not the exterior of oratory; but he pronounces every sentence so distinctly, with a confidence so modest, and an emphasis so true to Raphael and to nature, that those who attend are convinced, without being persuaded. To speak without a metaphor, there is something in his manner of employing his graver, something dry, unambitious, severe, unattractive to the sense; which, by all sound critics, has been thought to deserve praise, without desiring it; and peculiarly appropriate to the works of a painter, who not merely does not require, but will not admit, the aid of foreign ornament.

"The Dead Christ of Raphael, where the excess of his mother's sorrow is softened, but not subdued, by her divine resignation, he repeated with variations; of which the principal are, that, in the second plate, the Virgin Mary appears much younger than in the first, and her right arm divested of drapery; from which circumstance, it is known among collectors by the appellation of "The Virgin with the naked Arm." The second plate is more delicately engraved, but is feeble, when compared with the masterly vigour he has shewn in the first. The nudities are here drawn with Marc Antonio's, inspired by Raphael's, usual superiority; but the drapery and ground are softened and enriched beyond the ordinary powers of Marc Antonio's graver, and are so much in the improved style of his pupil, George Penz, as may incline us to suspect that these parts have been engraved by his hand. Whether Raphael authorized or allowed Marc Antonio to substitute the younger virgin, who seems more like the sister, for the elder, who is the mother of Christ, does not appear.

"In "The Virgin of the Palm," Marc Antonio discovers, if possible, a still more exquisite feeling, and of course produces a more perfect translation, of Raphael. Christ is bestowing his benediction with the sublimity of inspiration; and St. John receiving it with dignified and divine, though infantile, submission. The subordination of parts is just: the whole is perfectly graceful; and the head of the Virgin Mary, the most graceful part of that whole.

"Marc Antonio's powers as an engraver appear not to have declined from their acme, in his martyrdom of St. Lawrence, after Bandinelli. He not merely copied, but his long acquaintance with the works of Raphael enabled him, and his gratitude to Bandinelli, who had obtained his release from prison, disposed him, to improve the drawing of his original. The print is defective, yet not more so than many other of his works, in chiaroscuro: but, expression of the textures of substances, and the existence of reflex light, are here feebly acknowledged; the folds of the draperies are ample; the drawing of the naked excellent; and the characters of the heads far better than would seem to belong to the reputation of Bandinelli."

The several monograms with which Marc Antonio marked his engravings, from time to time, will be found in Plate I. of those of the *Italian School of Engravers*; though a great number of them were published without any other mark than an intelligent eye will perceive, in the peculiar style and purity of outline of this accomplished artist.

Connoisseurs are extremely, and very justly, observant of the goodness of the impressions, in collecting the works of Marc Antonio; and early and well preserved impressions sell for very considerable sums. Since they were first published, the plates have been successively the property of Tomaso Barlacchi, Antonio Salamanca, Antonio Lascri, and Nicholas Van Aelst; lastly, they became the property of the print-dealer Rossi, at which time, after being frequently retouched, and of course very much impaired, they were, as works of art, utterly worn out. Those impressions are the earliest, and by far the most valuable, which were taken before the name of any publisher was inscribed on them.

Baron Heinnekin, in his "Dictionnaire des Artistes," printed at Leipzig, A.D. 1778, has given a complete catalogue of the works of Marc Antonio, to which the curious reader is referred, and from which we have extracted the following list of those which are held in most esteem, beginning with his portraits.

Portraits.—An artist wrapped in a mantle, seated, and in an attitude of meditation; a little table, pallet, and colours, in the back ground; supposed by Malvasia to be the portrait of Raphael, drawn and engraved by Marc Antonio: Arcin the Poet, with a long Latin inscription; one of the very finest works of the artist: the Emperor Charles V. in his youth; Pope Clement VII.; both in medallion: Pope Julius II. holding a bonnet: Prince Octavius Farnese.

Subjects from Holy Writ.—"Adam and Eve," after Raphael, a very fine and rare print, the same which Strutt has copied and placed as the frontispiece to his second volume of the *Lives of the Engravers*; "Adam and Eve expelled from the terrestrial Paradise," after Michael Angelo; "Noah sacrificing after leaving the Ark;" "The Blessing of Abraham;" "God appearing to Isaac;" "The Escape of Joseph from Potiphar's Wife;" "David discomfiting the Philistines, and beheading Goliath;" "David," an erect figure, with the head of Goliath, a very rare print; all after Raphael.

"The Adoration of the Shepherds," either from a design by Marc Antonio himself, or after his first master Francia; two plates of "The Murder of the Innocents," after Raphael, in the second of which Marc Antonio has introduced the upper part of a small yew tree, called by the Italians la Felchetta, and which does not appear in the first. Good impressions of both these plates are extremely rare and valuable; "An Holy Family;" from the thigh of the Virgin Mary being immoderately long, this print is distinguished among connoisseurs by the name of "The Virgin of the long Thigh." Another "Holy Family," wherein the Infant Saviour reposes on the knees of his mother,

ther, who is bestowing her benediction on the little St. John. This is commonly known by the name of "The Virgin of the Palm." Another, called "The Virgin of the Cradle," from the circumstance of the Infant Christ being represented in his cradle; and two plates of the "Virgin and Child;" all after Raphael.

An "Holy Family," after Michael Angelo; a very rare print of an "Holy Family," after Raphael, wherein St. John is holding a reel, and St. Elizabeth is spinning; another "Holy Family," in which the Infant Jesus is receiving a fish from Tobit, distinguished by the name of "The Virgin of the Fish," and after a very celebrated picture which Raphael painted for the church of the Dominicans at Naples, and which has since been in the gallery of the Escurial; "The Holy Virgin sitting on the Clouds, with the Infant Christ," a plate which afterwards fell into the possession of Agostino Carrache, who re-touched it, and added two fine heads of Cherubs; a set (mentioned above) of seventeen plates, coarsely copied from the wood-cuts by Albert Durer, of the "Life of the Virgin Mary," and marked with Durer's cypher, except the last, which has that of Marc Antonio. These are in small folio, and very rare. A set of thirty-six small uprights, from Albert Durer's "Life of Christ," marked with the ordinary tablet of Marc Antonio.

A set of thirty-six small uprights, called "The Life and Passion of Christ," copied from Durer, but marked with the tablet of Marc Antonio. A duplicate set of these are by some critics supposed to be the production of Wierix, or some other of the disciples of Marc Antonio, and this set bears the cypher of Albert Durer. "Christ at the Entrance of the Temple, surrounded by his Disciples;" "St. Mary Magdalen at the Feet of our Saviour;" "Christ celebrating the Passover;" "The Descent from the Cross," in which, with the holy women, is introduced Joseph of Arimathea. Three prints, which are known among collectors by the title of "The Virgin of Grief." In one the Holy Virgin with extended arms is lamenting over the dead body of Jesus Christ. In the second, of which we have spoken more particularly above, and which is also called "The Virgin with the naked Arm," the holy mother appears much younger than in the first, and a dead tree is omitted: in other respects the two compositions are alike. And in the third, which is also a dead Christ, his head reclines on the lap of the Virgin; mount Calvary is in the back ground, and three disciples with Nicodemus are present. A glorified Christ with the Holy Virgin, St. John the Baptist, St. Paul, and St. Catherine, called "The Five Saints;" three of the cartoons, viz. "The Death of Ananias," (engraved in conjunction with Agostino Veneziano;) "Elymas struck Blind," and "St. Paul preaching at Athens." Proofs of the latter, before the two figures were placed within the balustrade of the temple of Mars, are extremely rare and valuable. St. Cecilia, with the Magdalen and other saints, known by the name of "The Saint Cecilia with the Necklace;" "The Martyrdom of St. Felicité." A duplicate plate of this subject, in which the right ear of the saint is omitted, is more scarce and valuable than the former. "St. Catherine resting on her Wheel of Martyrdom." A set of thirteen, of Jesus Christ and the twelve apostles. All these are of folio dimensions, and after Raphael.

"The Martyrdom of St. Laurence," a large folio, after Baccio Bandinelli, is a very fine engraving, which obtained Marc Antonio's release from prison, and recommended him to the favour of pope Clement VII. "St. George and the Dragon," either from a composition by Marc Antonio him-

self, or after his first master Raibolini. "St. Gregory celebrating Mass," from Albert Durer's wood cut, entitled "The Mystery of the Mass."

Subjects from Profane History and Greek Mythology — "The Rape of Helen," a grand composition: "Æneas retreating from the Conflagration of Troy, bearing off Anchises, and preceded by the young Ascanius;" "Venus appearing to Æneas in the Disguise of a Huntress;" (an early work of the master;) "The Death of Dido;" "The Death of Lucretia," inscribed in the Greek language, "better to die than live dishonoured," and the first plate engraved after Raphael by Marc Antonio; a subject, by some termed "Alexander the Great depositing the Poems of Homer in the Coffer of Darius," and by others "The Books of the Sybils placed in the Tomb of Numa Pompilius." A battle-piece, known among connoisseurs by the title of "The Battle of the Cutlasses," all after Raphael, and in folio.

From the same master he has engraven "The Three Angels of the Lodge of Chigi," of which the subjects are, 1st. "Jupiter caressing Cupid;" 2d. "Mercury descending from Olympus," and 3d. "Cupid and the Graces." A very grand composition of "The Judgment of Paris;" and from Andrea Mantegna, "Mars, Venus and Cupid," of which the collector should be careful to obtain those impressions that were taken before the name of Rossi was added as the publisher. "Apollo leaning against the Shepherd Hyacinthus, and accompanied by Cupid," is either after his first master Raibolini, or from a design by Marc Antonio himself. A tablet is here suspended, from a tree, on which is inscribed the date 1506, and A.E. 19 is added, which gives the year 1487 as that of his nativity.

"The Triumph of Galatea" is a capital print, of which the best and rarest impressions are before any letters, and those with the names of Van Aelst and Rossi are comparatively worthless.

"Mount Parnassus" is a large and grand composition from the celebrated picture in the Vatican, except that Marc Antonio has very properly substituted a lyre for a violin; the instrument upon which Apollo is playing in the original picture. It is not improbable that Raphael himself, having discovered the anachronism, directed this emendation.

The above two are after Raphael. A very fine engraving of a Bacchanalian subject, with children bearing baskets of grapes, and Bacchus seated on a tub, is also after Raphael, but was drawn by him from an antique bas-relief; "Bacchus and Silenus" is by some critics said to be after Julio Romano, and "Hercules smothering Antæus," after Michael Angelo: but others ascribe both these compositions to Raphael.

"The Battle of the Lapithæ," the last work of Marc Antonio, is of the frieze form, dated 1539, and after Julio Romano. Of "Orpheus" the designer is not certainly known. "Pyramus and Thisbe" is after Raibolini. "Le quos ego," or Neptune appeasing the Tempest which had dispersed the Fleet of Æneas, is surrounded by a border, in which are nine small compartments, containing subjects from the Æneid, and is after Raphael. Impressions of this plate, before it was retouched, are rare and very valuable. The disagreeable hardness which the abdominal muscles in the figure of Neptune have acquired in the retouching, renders them easily distinguishable.

The above are all of folio dimensions. In quarto, Marc Antonio has engraven a set of twenty amorous and indecent subjects after Julio Romano, to accompany the sonnets of Aretin, of "The Loves of the Gods and Goddesses," which are, as they certainly ought to be, exceedingly scarce, and a

set of thirty-two, of "The Loves of Cupid and Psyche," after Raphael, each accompanied by eight Italian verses.

Poetic Inventions, &c.—"Le Stregozzo," the design of which is by some attributed to Raphael, and by others to Michael Angelo. Sometimes it is called, "Raphael's Dream," and probably with great truth, for though it differs from the rest of his works, yet it differs not so much, but that it may be the production of his mind, and it possesses all the romantic wildness of a nocturnal chimera. A monstrous carcass is converted into a sort of triumphal car, in which is seated a forceful; it is drawn by naked men, and a youth mounted on a goat is blowing a horn. It is in very large folio, and in the later impressions the initials of Agostino Veneziano are added to the mark of Marc Antonio. "Il Morbetto," or The Plague, another large folio after Raphael, good impressions of which are extremely rare. Three figures from Michael Angelo's Cartoon of Pisa, dated 1510, and known among collectors by the title of "The Climbers." "Il Pito," or The Triumph of Love, an allegory, by some supposed to be after Andrea Mantegna. "The Emperor Trajan crowned by Victory," from a bas-relief on the arch of Constantine; "The Chace of a Lion," from another antique bas-relief; "The Cassiolette," a grand Bacchanalian procession, of the frieze form, nineteen inches in length; "An Offering to Priapus;" the statues of Apollo and Cleopatra; a bas-relief of "The Three Graces," and a dance of nine children, all after Raphael.

Agostino de Musis, surnamed Veneziano, from the place of his nativity, and called in England Augustin the Venetian, was born at Venice some time about the year 1490. He travelled to Rome for improvement, and became one of the most celebrated of the numerous disciples of Marc Antonio, with whom he sometimes worked in conjunction. From the circumstance of his earliest known engraving being dated in the year 1509, Strutt supposes that he began to study under Marc Antonio, whilst that distinguished master yet resided at Venice. Marc of Ravenna was his fellow pupil; and Vasari classes them among the very best of the Italian students who followed the art of engraving.

When the city of Rome was taken and sacked by the Spaniards in the year 1527, Agostino retired to Florence, and applied for employ to Andrea del Sarto, who was then in high repute, but del Sarto, dissatisfied with the dead Christ which he had already engraved after his design, refused to permit him to engrave any more of his pictures. Agostino afterwards returned to Rome, where he followed his professional pursuits with great success, and where he died some time about the year 1540.

He generally marked his prints with the initials A. V., which were sometimes inscribed on a tablet. He imitated the style of his master with great attention, and, as far as regards manual execution, with considerable success: sometimes, indeed, he in this respect excelled Marc Antonio; but in point of taste, and in the purity and correctness of his outline, he fell far short of that distinguished artist.

Good impressions of the works of Veneziano are now become extremely scarce, and a complete set is hardly to be obtained; among them will be found a few, wherein he has expressed the flesh entirely by means of stippling, in a manner which, being imitated by Boulanger, grew by degrees into what is now termed the *chalk* manner of engraving. The following list is believed to contain the description or titles of his best performances.

Portraits of Charles V. after Titian, supercribed with sixteen Italian verses; another of the same emperor, inscribed "Progeni divum quintus sic, &c. Æt. sua

XXVI.," a profile of pope Paul III. in a leathern cap; the same, wearing the papal crown, dated MDXXXVI.; all in folio. Ferdinand king of the Romans, in 4to. Francis I., of France, dated 1536; a profile of the emperor Soliman, dated 1535; Barbarossa holding a turban; all in folio.

Subjects from Sacred History.—"The Creation," a folio plate, engraved partly by Agostino and partly by Marc of Ravenna, and inscribed "Exc. Deus enim Omnia," &c. "Abraham offering up Isaac;" "The Benediction of Isaac," dated 1522; the same subject, with some trifling variations, dated 1524; "The Passage of the Red Sea," engraved in conjunction with Marc of Ravenna; "The Fall of Manna," a plate which presumptively was begun by Marc Antonio, and finished by Veneziano, all after Raphael and of folio dimensions. "Samson bound by the Philistines," a circular print, nine inches in diameter, is supposed to be from a composition by Veneziano himself.

"The Queen of Sheba visiting Solomon," after Raphael, has been attributed to the graver of Marc Antonio, but is by Agostino and Marc in conjunction, and one of their early performances. It is of the folio size.

A set of the four evangelists, in 4to. is after Julio Romano. "The Annunciation" is after Raphael, and engraved by the friends and fellow students Agostino and Marc; "The Nativity" is after Julio Romano; and both are of folio dimensions.

"St. John the Baptist in the Desert," of anonymous invention, dated 1532; perhaps designed by the engraver himself. "The Massacre of the Innocents," a rare engraving, is copied from the celebrated print of Marc Antonio; "The Last Supper," in folio, after Albert Durer; the same subject in smaller folio, attributed to Raphael; "Christ bearing the Cross," in folio, after Raphael, dated 1519; "The dead Christ," after Andrea del Sarto, a folio print, with which, as mentioned in our biography, the painter was so dissatisfied, as to refuse Veneziano the liberty of engraving from his works during his own lifetime. Another dead Christ, in small quarto, after Albert Durer, a very rare print; "The Archangel Michael," in folio, after Raphael; "The Holy Family," in small folio, marked only with the initials of our artist, and probably from his own composition; another "Holy Family," after Francia, dated 1516; "The Holy Virgin and Child, sitting on a Pedestal," six friars and a nun are present, and above are two angels, holding a tablet with an Ecce Homo, in folio; "The Crucifixion," with six figures of saints and angels receiving the blood of the Saviour, dated 1528, and also in folio; "St. Jerome," after Raphael, in quarto; "St. Margaret kneeling, and putting a Demon of the Serpent Form to Flight, by means of the Mirror of Truth," an early performance of Agostino, engraved before he frequented the school of Marc Antonio.

Subjects from Greek Mythology and History.—"Iphigenia en Tauride," an anonymous plate, in quarto; "Diogenes lying on his Cloak near the Margin of a River," a small engraving after Baccio Bandinelli; "The Loves of Alexander and Roxana," an anonymous plate, in folio, the design of which Vasari attributes to Raphael; "Tarquin offering Violence to Lucretia," in 4to. after the same master; a very fine copy of Marc Antonio's print of Lucretia, in quarto, with Latin verses beneath. "Camillus redeeming the Tribute imposed on Rome by the Gauls," and a naked figure of Cleopatra, both in small folio, and after Bandinelli; a small figure of Mars, after Raphael; "Vulcan presenting Venus with Arrows," dated 1530, and "Venus seated on a Dolphin," both

Both in folio, and after Raphael; "The Assembly of the Gods," engraved by Agostino and Marc of Ravenna; attached to which, by the same artist, is "The Marriage of Cupid and Psyche," both after Raphael. From the same painter, are "Leda carested by the Swan," in 4to.; "The Fall of Phaeton," in folio; and "Apollo and Daphne" in quarto; the latter of which is by some falsely attributed to the graver of Marc Antonio.

"The Dispute between the Muses and Pierides," an anonymous plate, in large folio, attributed by Vafari to the pencil of Rosso, and by the French to that of Perin del Vaga: this plate was afterwards re-touched and re-published in 1553, by Eneas Vico; "The Metamorphose of Neptune into a Horse," in 8vo., after Julio Romano, dated 1516; "A Bacchanalian Triumph," in 4to, after Raphael, or, according to Mariette, after Raphael del Colle; "The Entrance of Orpheus into Inferno," a small engraving, after Julio Romano, dated 1525; "The Infant Hercules destroying the Serpents," in small folio, after the same master; "The Death of Antæus," in small folio, after Michael Angelo, wherein Earth is personified as an old woman, dated 1533; "Hercules killing the Nemean Lion," a small print after Raphael, dated 1528, and a frieze of considerable length, of which Mariette attributes the invention to Bandinelli, and of which the subject is a female figure on Olympus, blowing a trumpet, in presence of the assembled deities.

Allegoric Inventions, &c.—"An old Man seated on a Bank, with a Cottage in the back Ground," one of the few plates wherein Agostino has stippled the flesh with the graver. Providence: on a tablet held by two angels is inscribed "Causar. Cognitio:" this is a small folio, and after Marc Antonio; "The Cumæn Sybil," after Raphael, in 4to., and dated 1516; "The Cemetery," in large folio, after Bandinelli. This is the print sometimes called "The Skeletons of Baccio," wherein Death is represented tearing a book in presence of various other skeletons; "The Battle of Charles the Rash," a small folio, dated 1518; "The Climbers," being part of Michael Angelo's Cartoon of Pifa, in large folio; "The Academy of Baccio Bandinelli," also in large folio; "A Combat between Five Warriors," also said to be from the celebrated Cartoon of Pifa, in 4to.: "The Three Marys (veiled figures), on their Way to the Sepulchre," in folio, an anonymous design, but attributed by Huber to Michael Angelo; another from Michael Angelo's Cartoon of Pifa, in 4to., a very rare print; "A Shepherd caressing a Shepherdess," in folio, after Raphael; "An aged Philosopher measuring a Disk," after Dominic Campagnola. A very rare print in 4to., after Raphael, of "A Female resting her Right Hand on a Vase;" "A Dance of Fawns and Bacchantes," of the frieze form, dated 1518, after an antique bas relief, but by some ascribed to Primaticcio. A set of sixteen plates of bronze and marble vases, from the antique, in small folio, inscribed "Sic Romæ Antiqui Sculptores," &c. Another set of thirty-six, in 4to., of grotesque subjects, after Raphael, some of which only are marked with the cypher of Agostino; the rest are by other pupils of Marc Antonio. A set of forty-eight busts, in 4to. "The Arch of Constantine," in a circle, dated 1517.

Marco Ravignano, commonly known by the name of Marc of Ravenna, was born at Ravenna in the year 1496. He studied at Rome, and became the pupil of Marc Antonio, and co-disciple and friend of Agostino of Venice.

As long as Raphael lived, *i. e.* till the year 1520, our two engravers worked together, after which each began to

engrave on his own account, and to mark his prints with his own peculiar cypher.

Mark died at Rome about the middle of the 16th century. Strutt says of him that he "imitated the bolder style of engraving which was adopted by his master, with great accuracy; but when he attempted to follow him in his neatest manner, he was not equally successful. He handled the graver with more freedom than his fellow scholar de Mutis, who, however, surpassed him in neatness and precision.

Ravenna drew well, as his best prints sufficiently testify; though not with that purity of outline which distinguishes the works of his master; neither are the extremities of his figures marked with equal correctness or judgment. His works, however, are justly held in estimation by the curious.

The usual mark adopted by this artist is a cypher, composed of an R and an S joined together, which has been the occasion of several mistakes, not only with respect to his works, but with respect to himself; and has led several authors to suppose that there were two Ravennas, the one named Marco, and the other Silvestro; and they have been confirmed in this opinion by the declaration of Vafari, who tells us, that Marco da Ravignano, for so he writes the name, marked his plates with an M and an R, which, in some few instances, he certainly did. Those, who do not suppose there were two Ravennas, have imagined that these two letters were designed for Raphael Sanzio, and placed upon the plate to denote that it was taken from a design by that master. This opinion, however, is easily confuted; for the same mark is found on "The Slaughter of the Innocents," after Baccio Bandinelli, and of course cannot, by any means, refer to Raphael. It certainly should be read *Ravenna* or *Ravignano, sculpsit*. He sometimes marked his engravings with a single R without the S, and at others, as will be found in our *Plate I.* of the Monograms, &c. of the *Italian School*.

Of the engravings of Ravignano, the following are those which are held in most request, beginning with the

Sacred Subjects.—A set of twelve, of the frieze proportions, from Bible history, after Raphael; "The Slaughter of the Innocents," a large folio plate, after Bandinelli. A duplicate plate of the same subject, differently cyphered, and without the name of the painter; "The Transfiguration," marked with an R on the bole of a tree, under which a disciple is seated; "The Last Supper," marked R, and from the same original as that by Marc Antonio; and "The Virgin of the long Thigh," varied from that by Marc Antonio, by the introduction of a small keg, all in folio, and after Raphael; "The Holy Family," after Polidore, in folio. A set of thirteen, of the Saviour and Apostles, in 4to., after Raphael, and distinguishable from those of Marc Antonio, by the cypher of Ravenna; "The Victory of St. Michael," in small folio, after Raphael; "The Cemetery, or Memorial of Death," in folio, after Bandinelli, but differing so widely from that by Agostino de Mutis, both in particulars and the general composition, as to warrant an opinion that it is engraved from another design.

Profane Subjects.—"The Rape of Helen," and "Alexander depositing the Works of Homer in the Coffer of Darius," both in folio, and after Raphael. A pair in folio, of "The Interview between Scipio and Hannibal," and "Scipio's Victory over the latter," after Julio Romano. A small anonymous print of an armed Jupiter, the design of which is attributed to Salvati; "Venus quitting Juno and Ceres," a small folio, from the fable of Psyche; "The Triumph of Galatea," in large folio, marked with an R;

and "Jupiter and Antiope," in small 4to., all after Raphael; "Euridice in Inferno," engraved in the taste of Marc Antonio, apparently after Julio Romano; "A Nymph and Triton," in 4to., anonymous, but after Raphael; "Polyphemus, attended by Cupid, pursuing Galatea;" "The Triumph of Galatea;" and "Apollo as a Shepherd guarding the Flocks of Admetus," all in 4to., and after the designs of Raphael. A set of three prints, called "The Nymphs of Marc Antonio:" the first, accompanied by Cupid, is drawn by two marine monsters, the second is watched by a satyr, and the third is drawing a thorn from her foot, all after Raphael; "The Birth of Venus," in folio; "Cupid mounted on a Dolphin," in 4to.; "Vulcan forging Arrows for Cupid," in 4to., all after the same painter; "A drunken Silenus, supported by two Bacchantes," an anonymous print, in 4to.; "A Satyr holding a Nymph in his Arms," anonymous also, but supposed to be after Julio Romano; and "A Combat between a Satyr and a Goat," of anonymous design, both in 4to.; "The Combat between Entellus and Daret," in folio, after Raphael; "Orpheus," in 4to.; "Poetry," a duplicate plate, or copy from that by Marc Antonio, of the same subject, in 4to., dated 1542; "Infant Bacchanals," from Julio Romano, in folio. An emblematical subject, in which are represented a lion, a fox, and a dragon, with the word "Ergo," an oval print.

Antique Bas Reliefs, Statues, &c.—A sacrifice from the antique, in 4to. The same subject reversed. A bas-relief, from the arch of Constantine, in folio. An antique frieze with architectural decorations: the subject is three cupids, or genii, two of whom hold shells, and the other a trident. The original is preserved in Ravenna, the native city of our artist, in the church of St. Vital, with the inscription "Opus hoc antiquum repertum Ravennae in aed divi vitalis MDXVIII." A battle piece, in folio. A female conducting a lion towards a funeral pile. Notwithstanding that this print is inscribed with the cypher of Marc of Ravenna, it is so much in the style of Marc Antonio, that some connoisseurs attribute it to his graver. A set of four bas-reliefs from the Trajan column, in small folio, and in a slight unfinished manner. The antique group of the Laocoon, a large upright folio, and exhibiting the only instance which has come to our knowledge, where the artist has inscribed his name nearly at length, omitting only the letter A in Marcus. Another engraving of this group, in folio, marked with the ordinary cypher of our artist, and inscribed on the base "Prout in II. deneidos P.V. Maronis." It is supposed by many that Raphael made the drawing for the latter print: both of them are rare and remarkable, as shewing the exact state of this wonderful monument of art at the time when it was discovered.

The remainder of Ravignano's engravings from the antique are, the equestrian statue of Marcus Aurelius, in folio, inscribed "Sic Romæ acæ sculp. ante Portum Ecel. &c." The three Graces. A naked female drawing a thorn from her foot, called "The Venus of the Rabbit." Two females with a cassolette or censer, after Raphael. Statue of a man sitting, inscribed "Roma in Capitolio," all in 4to. Mutated statue of an emperor, marked with the large R, a small folio plate.

Julio Bonafoni, or Bonafone, was a native of Bologna, and for that reason is sometimes called Bolognese: he was born in the year 1498, and died at Rome in 1564. He studied the rudiments of art under Laurent Sabatini, a Bolognese painter, but afterwards became the disciple of Marc Antonio. He worked from the pictures of Raphael,

Julio Romano, and other great masters, and occasionally from his own designs. Excepting one or two subjects, in which he called in the assistance of the point (which, however, he never well understood the use of), his plates are executed entirely with the graver, in a manner though much varied from that of his tutor, yet evidently founded upon it. It is neither so firm, nor so clear and masterly. His drawing is often heavy, and the extremities of his figures frequently neglected. The folds of his draperies are seldom well expressed, and the back-grounds to his prints, especially his landscapes, are extremely flat and stiff. However, with all these faults, which are not always equally conspicuous, his best prints are not without their merit; and though not equal to those of his master, are held in no small degree of estimation by the generality of collectors. One thing in particular is remarkable in them, namely, the attempt which he has made of preserving the masses, and a breadth of light and shadow, as well upon the groups of figures, as upon the figures separately.

Mariette has written a catalogue raisonnée of 190 selected engravings by this master; and Mr. Cumberland a small book, wherein he bestows on Bonafoni much more praise than he deserves.

Bonafoni sometimes affixed to his prints his name at length, sometimes he contracted it, but not always in the same manner; and sometimes he employed the monogram, which will be found in our Plate I. of those of the *Italian Engravers*. The most esteemed of his engravings are those which follow.

The *Portraits* of Pope Marcelle II. in 4to., anonymous, and very rare; Philippus Hispaniarum Princeps, Caroli V. filius, in large 4to.; Cardinal Bembo, aged 77, after Titian; Raphael d'Urbino; Michael Angelo Buonarroti, aged 72, in a circle; Franciscus Flori of Antwerp, a Belgic painter; Johannes Bernardinus Bonifacius; and Niccolo Ardighello, Cardinalis, annuæ ætatis XLIII.

Sacred Subjects.—"The Creation of Eve," after Michael Angelo; "Adam and Eve in Paradise:" they are sitting in an arbour embracing each other; and "Adam and Eve after the Fall:" Adam is here digging the earth; Eve is spinning; and two children are present. These are in small folio, and from compositions by Bonafoni himself; "Adam and Eve driven out of Paradise," a small folio, after Amico Aspertini; "Joseph sold to the Ishmaelites;" and "The Cup found in Benjamin's Sack," both after Raphael; "The Fall of Manna and Moses striking the Rock;" on the same plate, after Parmegiano; all in small folio; "Judith leaving the Tent of Holofernes," a large folio print, after M. Angelo; "The Nativity," designed by the engraver, in 4to. Another of the same subject, in folio, from a grand composition by Julio Romano; "The Adoration of the Shepherds," in folio, of anonymous invention, but attributed by Malvasia to Parmegiano; "The Holy Family," a folio print, after Julio Romano; another "Holy Family," where St. Joseph is seated on an ass, designed by Bonafoni; "A dead Christ," after Raphael; "The Entombing of Christ," after Titian; "The Resurrection," designed by Bonafoni himself; "St. Peter placed at the Head of the Church," after Raphael; "St. John and St. Peter healing the Sick," after Perino del Vaga; "St. Paul preaching to the People," an oval, after Perino del Vaga, all in small folio. A large folio upright plate, arched at the top, of "The Last Judgment," after Michael Angelo, inscribed "Julius Bonafonius Bonon, propria Michaelis Angeli pictura quæ est in Vaticano, nigro lapillo excepit in æsq̃ue inedit;" "Jesse, David, and Solomon," in folio, from the celebrated picture

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in the Sistine chapel, by the same master; "St. Joachim and St. Ann presenting Mary their Daughter to the High Priest," after Parmegiano; "Christ meeting St. Peter at the Gates of Rome," after Raphael; "The Virgin and Child," after Parmegiano; "St. Cecilia," after Raphael; "St. George," after Julio Romano; "The Emperor Augustus, and the Sybil," after Parmegiano, all in small folio. In 4to. a set of twenty-nine prints, from "The Life and Passion of Jesus Christ;" and in 8vo. a set of thirteen, from "The Life of the Holy Virgin."

Profane Subjects.—"Achilles dragging the Corse of Hector at his Chariot Wheels;" after Primaticcio; "The taking of Troy," after the same painter, a large folio, engraved on two plates; "The Dispersion of the Fleet of Eneas," after an anonymous, but very indifferent design; "Alexander and Bucephalus," in folio, from a composition by Bonafoni; "Cimon nourished by his Daughter," of the frieze form, after Polidore; "A Combat of Cavalry," being the first idea of Raphael for his battle of Attila; "Scipio wounded and retiring from the Combat," from a design by Bonafoni; "The mysterious Saturn with his Three Sons," after Julio Romano. A set of twenty-two small engravings, designed by Bonafoni, of the loves, diffidains, and jealousies of Juno; "The Rape of Europa," after Raphael, in large folio; "Mars and Venus," in folio, after Primaticcio; "Vulcan discovering the Amours of Mars and Venus," in 4to., of anonymous invention; "Venus attired by the Graces," in 4to., after Raphael; "The Birth of Adonis;" "The Triumph of Cupid and Psyche;" and "Phœbus in his Car, attended by the Hours, with Time walking on Crutches before them, and a Man and Woman waking from Sleep," are all in small folio, and from compositions by the engraver himself; "The Destruction of the Children of Niobe," after Perino del Vaga, dated 1541; "The Fall of Phaeton," in large 4to., after M. Angelo, and a group of three females, after the same master, in folio.

From Antique Sculpture and Architecture, &c.—Small busts of Jupiter, Juno, Latona, Bellona, and Minerva, five plates; "Hercules and Dejanira;" "A Satyr and Nymph;" "The youthful Olympus holding a Flute;" "The Flight of Medea," a bas-relief; a ditto representing "A Female and Two Children seated;" "The Loves of the Centaurs," with grotesque foliage, all in 4to.; "The Temple of Jupiter and that of Neptune," both in folio; and a considerable number of book-plates, the subjects of many of which are from the amours of the heathen deities.

Jean Baptista Franco, was born at Venice in 1498, and died in the same city, A.D. 1561. He learnt the principles of design in his native country; but travelled to Rome to perfect himself by studying the works of Michael Angelo. According to Vasari, he made a drawing after the famous Last Judgment of that master, which passed in his time for a chef-d'œuvre. Franco had an excellent taste in design, and perfect knowledge of anatomy. He excelled greatly in the correctness of his contours, and the learned manner in which he indicated the play of the muscles. But as a painter he was deficient: he knew very little of composition; or colouring, his pictures were therefore without harmony, and hard. He felt their imperfections, and quitting painting, applied himself to drawing and engraving. Of whom he learnt the art of engraving we are ignorant: it has been said he was of the school of Marc Antonio; but the mechanical part of his engraving bears more resemblance to that of Julius Bonafoni. He used the graver, and probably that instrument alone, notwithstanding that many of his prints appear as if done with the point. His taste was free, and he worked in a grand style; his figures were generally

well proportioned, and his attitudes various and well contrasted; his heads were often small, but always well designed and characteristic; and the other extremities were rendered with the hand of a master.

Franco generally marked his prints B. F. V. F. that is to say, Baptista Franco Venetus Fecit; and his best engravings are as follow:—"Abraham receiving Melchisedec;" "The Sacrifice of Abraham;" and "Moses striking the Rock;" all in small folio. "The Israelites receiving Manna in the Desert;" in large folio. "The captive Kings brought before Solomon;" ditto. "The Adoration of the Shepherds;" "The Virgin sitting at the Foot of a Rock, caressing the Infant Jesus, and in the back ground the little St. John;" "St. John the Baptist lying on the Earth;" all in small folio. "St. Jerome holding a Death's Head;" a large folio print. "Jesus Disputing in the Temple with the Doctors of the Law;" "The Disciples laying the Body of Christ in the Tomb;" large folio. "Simon the Magician, practising his Impostures before the Apostles;" "A Cyclop in his Forge, with Cupid at his Side;" "Hercules bending his Bow against the Centaur Nessus;" "Two Leopards, two Lions, a Wild Goat, and a Griffin," from the antique; "The Donation to the Roman Church, by the Emperor Constantine," after Raphael; "A Bacchanal," a grand composition, from Julio Romano; "Triumph of Bacchus," a grand composition, all in large folio; "The Deluge," in small folio.

Jacques Franco was born at Venice some time about the year 1560; and probably of the same family as Baptista. His taste in engraving bore much resemblance to that of Augustin Carrache, of whom he was the contemporary. He was a good designer, and marked his heads and other extremities very well: among the number of his productions, the following are the most esteemed:—Part of the 4to. engravings for the edition of Tasso's Jerusalem, which was published at Genoa in 1590, after the designs of Bernardo Castelli; the rest are done by Augustino Carrache; a collection of portraits of great men, published in 1626, dated 1596; "The Crucifixion," a small piece, marked Giacomo Frauchio fec.; "St. Jerome," ditto; "Hercules between Vice and Virtue," from an antique bas relief; besides many other plates after Baptista Franco.

Nicholas Beatrice, Beatrici, or Beatrizet, was a native of Thionville in Lorraine, but studied engraving in Italy, and chiefly at Rome. He was born some time about the commencement of the sixteenth century, and continued practising his art at Rome till the year 1562, about which time he probably died. Whether he became the disciple of Marc Antonio, or of Agostino of Venice, is not certainly known: Strutt thinks he studied under the former. A sedulous contemplation and imitation of Marc Antonio's excellent print of "Neptune calming the Tempest," after Raphael, certainly contributed to the formation of what little he possessed that might be called style in his art. Yet it is much more the merits of Michael Angelo, Raphael, and the other great masters after whom he engraved, than his own, which makes his prints desirable, for he neither drew accurately, nor had attained any considerable powers in handling his graver; and his knowledge of chiaro-scuro was but very superficial.

The opinion which was held by many collectors, that Beatrice was the author of the engravings which are marked with a small die, inscribed with the letter B, seems at length to be justly abandoned. They are the performances of a superior artist, and perhaps of Bartholomew Beham. The marks which do belong to him will be found in our Plate 1. of the monograms of the *Italian School of Engravers*.

The

The prints by this artist which are most sought after, are those which follow, beginning with his

Portraits.—Pius III. with a Latin inscription; Paul III.; Paul IV. dated in 1558; Pius V.; Henry II. of France, dated 1558; another of the same monarch, with accessories, dated 1556; Hippolito Gonzague; Don Juan of Austria, in an oval, with the battle of Lepante in a cartouche, and other accompaniments; a set of medallions of the kings of Poland. All the above are of folio dimensions.

Subjects from Sacred History.—"The Death of Abel," in 4to.; "Joseph interpreting the Dreams of his Brethren," in folio, after Raphael, one of the best of Beatrice's engravings; "Abigail meeting David," a small folio, of which critics have disputed, without settling whether the design is by M. Angelo, Bandinelli, or Julio Romano; "The Nativity of the Virgin Mary," after Bandinelli; "The Annunciation," after M. Angelo; "The Adoration of the Magi," after Parmegiano; "The Holy Family," after Jerome Mutien; "The Good Samaritan," after M. Angelo; "Jesus Christ on the Mount of Olives," after Titian; "The Crucifixion," after Mucianus Brixianus; "The Virgin in Grief," after M. Angelo; "The Descent from the Cross," after N. Circignani; "The Ascension," after Raphael; "The Conversion of St. Paul," after M. Angelo; "St. Michael's Victory over the Devil," after Raphael, all in folio; "The Holy Virgin distributing Rosaries," a large oval print; "The Adoration of the Holy Cross," (an altar piece in large folio); "The Prophet Jeremiah," from M. Angelo's picture in the Sistine Chapel; "St. Jerome," after Titian; "St. Elizabeth, of Hungary, healing the Sick," after Mucicno, all in large folio; and "The Last Judgment," a very large print engraved on several plates; from the far famed picture of M. Angelo.

Subjects from Profane History, &c.—"The Sacrifice of Iphigenia," after del Vaga, or Salviati; "The Rape of Ganymede," after Michael Angelo; "The Fall of Phaeton," after the same master: Strutt speaks highly of this engraving, but says it was not originally the work of Beatrice; "A Bacchanalian Piece," after Michael Angelo; "The Dream of Human Life," after the same master; a very singular allegorical print, exhibiting the influence of the passions, and said, by some, to be composed and painted by Michael Angelo, from a vision which he really experienced; "The Archers," from the same master; "Vertumnus and Pomona," from Jacobo Fiorentino; "The Combat of Reason and Love," after Bac. Bandinelli, called here Bradiu; "Combat of five Men against five ferocious Beasts; two Lions, a Bear, a Bull, and a Wild Boar," anonymous, marked 1532, attributed to Julio Romano; "Battle of the Amazons," after a grand bas-relief on a sepulchral urn in the Capitol, a large piece, on two plates; "The Battle of the Dacians," from the Arch of Constantine, inscribed "Tabula marmorea Pugnae Dacicae, &c.;" "The Emperor Trajan in a triumphal Car;" "The Pantheon of Agrippa;" "The Temple of Fortune," from a drawing by Raphael; all in folio; "The Grand Circus," a large print engraved on two plates; "Front of the Farnese Palace," after Michael Angelo; "The Statue of Moses," from Michael Angelo; "Equestrian Statue of Marcus Aurelius," engraved in 1558; a standing figure of Christ, after Michael Angelo; "Statue of the Philosopher Anaximenes reading," since retouched, and re-named "St. Paul;" "The Castle of St. Angelo;" "Siege and taking of Theonville," a bird's-eye view, dated 1558. Most of the above are of large folio dimensions.

The foregoing artists worked with the graver only, but the art of etching had now travelled from Germany to Italy,

and Leo Daris, otherwise called Leon Daven, or Louis d'Avesne, who was the countryman and contemporary of Beatrice, is believed to have been among the very first who practised it in Italy. He was born some time about the year 1500: studied at Florence and at Rome, and returned to France, perhaps to Lorrain, or still more probably, to Fontainebleau, with Primaticcio, after whose compositions his principal works are for the most part engraved.

His style is singular, and though not inimitable, has not often been imitated. His plates are chiefly etched in rather a coarse but spirited manner, in short hatchings: his lights are kept broad and clear, but his shadows want degradation, his outlines are stiff and hard, and his heads, hands, and feet, are not correctly drawn. The following list will probably be found to contain his best engravings:—"Venus blinding Cupid," designed by the engraver, in 4to. A pair, of "Jesus Christ," and "The Holy Virgin," each surrounded by a glory and heavenly host, after Primaticcio; from whose pictures Daris also engraved, an "Holy Family;" "The victorious Saviour;" "Alexander and Bucephalus," an oval; "The Marriage of Alexander and Roxana;" "Cleopatra standing under a Tent, holding the Asp in her Hand, and resting the other on a Vase;" "The Continence of Scipio;" "The Rape of Europa;" "Danae in the Shower of Gold," an oval; "Jupiter pressing the Clouds to cause Rain on the Earth;" "Venus bathing," a grand composition, where there is in the back ground an old woman bringing refreshments, in a sculptured border; "Venus entering with Mars into a Tub;" on the foreground are cupids playing with the arms of Mars, and two women with vases; "The Forges of Vulcan;" "The Rape of Proserpine;" "The Chace of a Stag;" "The Repose of Diana after the Chace;" (she is lying by the side of her game with a dog under her arm); marked Fontainebleau; "Hercules undressing to enter the Bath with Omphale," ditto; "Hercules in the Arms of Omphale, surprised by Fawns, with Flambeaus;" "Cadmus preparing to combat the Dragon;" "The Masquerade;" "The Elephant and the Caravan," all in folio, and after the pictures of Primaticcio.

After Rosso, our artist has engraven "Francis I. of France surrounded by his Court;" the same monarch entering the Temple of Glory; "Venus and Adonis;" and "The Dispute between Neptune and Minerva."—After Lucas Penni, "The Trojan Horse;" "Jupiter seated on his Throne;" "Psyche approaching the Dragon-guarded Fountain;" and "Parnassus with Apollo and the Muses."—After Julio Romano, "The Combat for the Body of Patroclus;" after Parmegiano, "Circe and Ulysses," and a battle, after an antique bas-relief, all in folio.

Lucas Penni was born at Florence some time about the beginning of the sixteenth century, and was the brother of Giovanni Francesco Penni, surnamed Il Fattore. He frequented the school of Raphael, and studied a considerable time under Perino del Vaga. He possessed considerable merit as an historical painter, and George Ghili of Mantua has engraved from several of his pictures. After visiting Genoa and Lucca, he travelled to England, where he was employed by Henry VIII.; he afterwards went to France, and practised the fine arts for a while at Fontainebleau. On his return to Italy he applied himself to etching and engraving, and we have several meritorious prints from his hand; he sometimes worked from his own design, but oftener from Rosso and Primaticcio. His mark was usually composed of an L and an R joined together, or separate; for he chose to add the word Romanus, or the Roman, to his name, or the initials of it; but it is necessary to caution the young collector, with re- spect

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spect to these marks, all of which will be found in our *Plate II.* of monograms of the *Italian Engravers*, because they were used by other masters greatly inferior in point of abilities to Penni, and to state that his engravings are not only executed in a very spirited style, but also accurately drawn. He chiefly etched, but at times worked with the graver only.

The following is a list of his principal works:—"Two Satyrs giving Wine to Bacchus;" "Leda drawing Arrows from Cupid's Quiver;" "Susannah at the Bath surprised by the Elders," all of which are from Rosso: but the four following are from Primaticcio; "Abraham sacrificing Isaac;" "The Marriage of St. Catherine;" "Jupiter metamorphosing Calisto into a Bear;" and "Penelope at work with her Women," all of which plates are of folio dimensions.

At the same period with Penni lived Francesco Marcolini, of Forlì, an ingenious engraver on wood, who engraved, printed, and published a volume, entitled "*Giardino de Pensieri*," ornamented with wood cuts after Jos. Salviati. The subjects are emblematical and satirical, and are executed with considerable delicacy for that mode of engraving. Marcolini was also an architect of no mean talent.

Another engraver on wood, Giovanni Niccolò Rossiliani, or Vicentino, also lived at this period, he was of Venice; of mediocre talent; engraved a few subjects after Raphael, and "The Entry of Henry III. into Venice."

Battista Vicentino, so called like Rossiliani, from his birth-place, has been sometimes mistaken for him. According to Vasari, he was born at Venice in the year 1500, and engraved, in conjunction with Baptista del Moro, fifty subjects of landscapes and ancient edifices, in a firm and agreeable style; these are chiefly of folio dimensions, and among them are Monte Quirinalis, the Coliseum, &c. &c.

The Ghisi of Mantua, each of whom was successively termed the Mantuano, were a numerous family of artists. Jean Baptiste, the patriarch of this Mantuan race, was born at the commencement of the sixteenth century, and, according to Vasari, was the disciple of Julio Romano, and he was occasionally painter, statuary, architect, and engraver. In the latter art he worked with the graver only, and his style bears resemblance to that of Marc Antonio, when mingled with the work of his pupil Penni, as in the celebrated print of "Neptune rebuking the Winds," where the lines of the shadows are gradually blended into flippled light. Baptista understood the human figure, but his drawing is mannered, and his effects deficient in harmony.

His usual mark will be found in our *Plate I.* of monograms of the *Italian School*, and his principal engravings are: a large folio, of which the subject is a "Naval Combat," from a composition by himself, dated 1538; some heads of warriors, helmeted, in 4to.; "The Holy Virgin suckling the Infant Christ," in 4to. dated 1539; "David beheading Goliath," in folio, dated 1540; "A Warrior eloping with a Female," probably the Rape of Helen, 1539; "A River God," after Lucas Penni, in 4to.; "Mars, Venus, and Cupid," in folio; "The Conflagration of Troy," a capital print from his own design, of large folio dimensions.

Georgio Ghisi was born at Mantua A.D. 1524. He was the nephew, or, as others say, the son of Jean Baptiste, whom we have mentioned above, and appears to have learned from him the rudiments of engraving, though in the progress of his studies he much improved the style of his predecessor.

Georgio was eminently successful in the technical and academical parts of the art: in particular he studied the extremities of the human figure with much attention; and ex-

pressed the knitting of the joints and turns of the limbs with considerable accuracy. The knees of his figures especially, he frequently drew in a manner which has been justly admired. There is, indeed, a sameness of style in the drawing and marking of his figures, which has made it suspected that he always drew from the same individual model, and thus obtruded a manner of his own, instead of rendering the forms of the great painters after whom he worked in all their variety. This may be the reason why he has succeeded so indifferently in working from Michael Angelo; whose forms lie to a certain degree caricatured: the swellings of the muscles being too powerfully expressed, the lights became divided, the masses confused, and the necessary degrees of roundness impaired in the effect. These faults may be but too obviously seen in "The Last Judgment," engraved after that celebrated master, where the dorsal and abdominal muscles, as well as those of the limbs, are marked in a heavy, affected, and unpleasing manner.

Such defects as these, however, which do not always predominate in the works of Georgio, are often more than counterbalanced by the degrees of truth and beauty which are found in them.

Indifferent impressions of his prints are by no means rare, but such as are finely printed and well preserved appear but seldom, yet without seeing them, it is impossible to form an adequate idea of the merits of this engraver. His monograms will be found in our *Plate I.* of those of the *Italian School*: and the following are among his most justly valued performances.

"The Mystery of the Trinity," from his own composition; "The Prophets and Sybils" of Michael Angelo; a set of six upright folios from the pictures in the Sistine chapel; "The Last Judgment" of Michael Angelo, a very large upright, arched at the top, engraved on ten or eleven plates. The portrait of pope Julius II. after Raphael; and from the same master, "A Holy Family;" "The School of Athens," very large, and "The Dispute of the Sacrament."

His print of "The Dream of Raphael" is of doubtful original, for while some call it by this name, others term it "Michael Angelo's Melancholy." It is of large folio dimensions, dated in 1561, and represents an aged philosopher contemplating a shipwrecked vessel, while a nymph advances towards him: in the back-ground are strange and fantastic appearances. Bafan says that Raphael had no hand in it, yet the words "Raphaëlis urbinatus inventum," are affixed to it, and the style of composition and design appear to justify the inscription.

Of a long 4to. size are, a female sitting in a boat, to whom an old man is bringing a new-born infant, of anonymous invention; and a winged female holding a globe. The remainder are in folio, viz. an allegorical print, in compliment to the birth of the prince of the house of Gonzague, after Julio Romano; "Cupid and Psyche crowned by Hymen," and "The Birth of Memnon," both from the same master; the latter one of the finest engravings from the hand of Mantuano; "Cephalus and Procris," from the same; "The Interview between Scipio and Hannibal, previous to the Battle of Zama;" "Regulus reviled by the Carthaginians," and "Regulus enclosed in the Cask," all after the same master; "Venus at the Forge of Vulcan," is after Perin del Vaga; "Mars and Venus," after Raphael del Reggio; "Diana and Endymion," after Lucas Penni; "The Adoration of the Shepherds" is very large, and engraved on two plates, after Angelo Bronzini; "The Last Supper," after L. Lombart; "Hercules vanquishing the Hydra of Lerna," after Bertano Mantuano;

tuano; and after the same master, "The Judgment of Paris," "The Grecian Heroes before Troy," "The Destruction of Troy," and "The Cemetery," sometimes called "The Resurrection of dry Bones," a fine specimen of the artist's ability, wherein skeletons, tombs, and emaciated figures form a grand composition.

Adam Ghisi, also known by the cognomen of Mantuano, was a younger brother of George, and engraved much in the same style, though he was certainly somewhat inferior to his elder brother, both in correctness of outline, and the ability with which he handled the graver. The cypher with which he sometimes marked his engravings, will be found in our *Plate I.* of those of the *Italian School*, and among his best works are the following:—"Nativita de Nostra Signore," after Julio Romano, which is thus treated: In the heavens is the Deity surrounded by the heavenly host; lower in the composition is the Holy Ghost, surrounded by a radiance, and on the earth is the Holy Virgin and Child, and St. Joseph; "The Presentation in the Temple," after Nicolas Martinelli; a group from the marble of Michael Angelo, called "The Virgin of Pity," of which the subject is a dead Christ laying across the knees of his afflicted mother. Collectors should be careful to note, that in the early impressions, as the plate came from the hands of Adam Ghisi, the back ground is black, but it has since been re-touched, and a landscape background added by Ant. Lefreri, who, however, has affixed his own name to the print. The above are all of large folio dimensions.

In 4to. our artist has produced, "Mars preparing for Battle," and "Diana preparing for the Chase," either after Julio Romano, or from designs by himself; "Angelica and Medora;" "Diana and Endymion;" "Hercules and Ioli;" "The Choice of Hercules;" "Two Cupids conducting a Car with a river God;" and "Two Cupids riding on Dolphins," both of the oval form; and "The God Pan playing on the Syrinx, with Venus and Cupid listening."

Diana Ghisi, of Mantua, was sister to the two preceding. The year of her birth has not been recorded. She was a woman of considerable ingenuity, and probably learned drawing and engraving from her brother George, whose style she successfully imitated. She employed no monogram or cypher, but marked her engravings, of which the following are the principal, with the name of Diana, sometimes without any addition:—"A Conversation Party of three Figures," and "The Holy Family," both of anonymous invention, and perhaps done from compositions by herself; another "Holy Family," in a landscape ornamented with ruined edifices, after Correggio, in large folio, dated 1577; another "Holy Family," after Raphael, where the little St. John is presenting a scroll to the Infant Saviour, while St. Joseph, in the back ground, reposes on the base of a column, in folio; "The Virgin Mary caressing the Infant Christ," after F. Salviati, in small folio; "The Holy Virgin and Child sitting on Clouds, and attended by the Archangels Gabriel, Michael, and Raphael:" this plate is probably engraved from her own composition, and the earlier impressions are without the inscription "Regina Angelorum:" it is in large folio; "The Institution of the Papacy, or St. Peter appointed Head of the Church," after Raphael; "The Woman taken in Adultery," after Julio Romano; "The Heroism of Horatio Cocles," after the same master, all in large folio; "The Continence of Scipio," in small folio; and "The Birth of Calor and Pollux," which latter is perhaps the very best of Diana's engravings, are also after Julio Romano.

We shall add to this list but one more, namely, "The grand Festival of the Gods," after the same great painter, done from the celebrated picture in the palace del T. at Mantua. It is a very large production, which Diana, from a motive of convenience, has engraved on three plates.

Of Domenico del Barbieri, better known by the name of Fiorentino, we shall say but little; for, as an engraver, he merits not much, though he painted in stucco, under the superintendence of Rosso, with considerable ability. He was born at Florence in the year 1506, or thereabouts; and travelling to Fountainbleau in the year 1544, worked with credit from the designs of Primaticcio and Rosso. His engravings, which are executed in a stiff and incorrect manner, are sometimes marked with his name at length, with the occasional addition of Fiorentino, and at others with the cypher which will be found in our *Plate II.* of the monogram, &c. of the *Italian Engravers*.

Besides several plates of groups, and sometimes single figures, from the Last Judgment of Michael Angelo, he engraved a "Reposo," in which the holy family are attended by angels, in large folio; "A dead Christ," from Salviati; and an antique Banquet, from Primaticcio, both in small folio; "Mars and Venus," from Rosso, in 4to.; and "An Angel, or Figure of Fame, standing on a Globe holding two Trumpets," in folio.

We have now to speak of that extraordinary artist, Francesco Mazzuoli of Parma, more commonly known by his cognomen Parmegiano. He was born A.D. 1505, and died, at Castell Maggiore, at the early age of 35; yet in that short life very high degrees of excellence were attained in the art of painting and etching, notwithstanding that no inconsiderable portion of it was fruitlessly spent in alchemical pursuits.

For an account of his merit as a painter, see MAZZUOLI. He acquired the first rudiments of art under the tuition of his two uncles at Parma, and at the age of 16 surprised the partiality of relationship, and even astonished the existing taste of that part of Italy, by the production of a picture of "St. John baptizing the Saviour in the River Jordan;" but the fame of Raphael and Michael Angelo soon attracted him from his native city to Rome, where he remained till Rome itself was sacked, studying with ardour from the works of those great artists, yet at times retarded, in no trifling degree, by his unfortunate predilection for alchemy.

It has been stated by some writers, and is generally believed, that Parmegiano (if not the inventor of etching) was the first Italian who successfully practised that art. Strutt says of him, with great justice, that "in the etchings of this great master we discover the hand of the artist, working out a system, as it were, from his own imagination, and striving to produce the forms he wanted to express. We see the difficulty he laboured under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no instruction. It appears to be something entirely new to him without the knowledge of any thing better. We know that he certainly was not the first inventor of etching, because it was practised in Germany before he was of age to attempt it; yet it appears as if he had been unacquainted with the prior discovery, or only knew of it imperfectly by report; and in the latter case he might have been nearly as much at a loss as in the former. The spirit and genius which appear through the clouds are such as justly render his etchings exceedingly valuable; and on this account they have been often copied, and sometimes indifferently. The mechanical part of them is scratched in with the point, often badly corroded with the aquafortis, and re-touched with the graver, without

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the least appearance of knowledge as an engraver. But looking beyond these defects to the sweet characters of the heads, to the elegant turns of the figures, and to the beauty and simplicity of the composition of these rude sketches, what is wanting in the excellency of the mechanical part of the art, is abundantly supplied to the judicious eye, in the fire and animation of the master. The copies are always better than the originals, with respect to the regularity of the workmanship; but even the best of them are exceedingly defective in style and spirit, so that they are easily distinguished upon comparison. Good impressions of the originals are very rare; such, I mean, as are not re-touched. From the foulness of the copper upon which he engraved, and the little skill he had in managing the aquafortis, his etchings are seldom clear or perfect in their appearance, though some indeed are greatly superior to others in this respect; and those perhaps he executed in the latter part of his life.

"It is also said that he engraved many prints on wooden blocks in *chiaroscuro*; but it is much more likely, as Bafan justly observes, that he was only the designer and director of these works, and that they were executed by Ugo da Carpi, Andrea Andreani, and other masters."

The alarms of war, much more the distresses and horrors of a siege, are destructive to the pursuits of an artist. When Rome was taken by the Spaniards, Parmegiano retired to Bologna, whither misfortune pursued him. Many of his designs, etchings, and *chiaroscuro* blocks, were here stolen from him by an engraver, whom he retained in his service, and whom Huber calls by the name of Antonio de Trente, and De Piles, Antonio Frontana. They were afterwards recovered, or recovered in part; but whether by legal process, or the remorse of Antonio, has not been explained. Poor Parmegiano was for a time almost distracted by the event, which, with a debt due to the church, and other misfortunes, drove him from Bologna to Castel Maggiore, where he soon after died of a fever.

The most important of the prints from the hand of this great master, are, "Moses and the Burning Bush," a small plate, and apparently one of his first attempts in etching; "Joseph solicited by the Wife of Potiphar," and "Judith with the Head of Holofernes," both in small 4to.; an antique sacrifice; a set of thirteen small uprights, of Christ and the twelve apostles; "The Virgin Mary receiving Inspiration from the Holy Spirit;" "The Adoration of the Shepherds," a small upright; "The Marriage of St. Catherine," in small 4to.; "A Holy Family," where the Virgin is seated, and the Saviour is lying in a cradle; another "Holy Family," where St. John is presenting a basket of flowers to the Infant Christ, in folio; another "Holy Family," in larger folio, where a bishop and a saint are introduced; a very rare print, done with the graver, marked "Franc. Parm. fecit," and of folio dimensions, of which the subject is also an "Holy Family;" "The Entombing of Christ," a small upright folio, which Guido has copied of the same size; "The Resurrection of Christ," in 4to.; "A Shepherd leaning on his Crook;" "A Mother instructing her four Daughters;" a back figure of a man with a woman seated by his side; all from his own compositions.

After Raphael, he has etched the celebrated cartoon of "St. Peter and St. John healing the lame Man," in small folio; of which Strutt says, that it is one of Parmegiano's finest and most determined etchings, adding, "we see he has mixed his own sweet manner with that of Raphael, in the treatment of the heads, and it seems to me to lose nothing by the alteration."

We conclude our list of his etchings with those of "Pene-

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lope engaged with her Women at Embroidery;" "Diogenes busied with mathematical Diagrams at the entrance of his Tub;" and a small folio of the "Adoration of the Magi," in *chiaroscuro*.

Antonio de Trente was born at Trentin A.D. 1508. He studied under Parmegiano, though but three years older than himself, and became a painter of some merit, and an excellent engraver in *chiaroscuro*, which latter art he is presumed to have learned from Ugo da Carpi. His style of engraving is by no means elaborate, and his extremities are often neglected, yet his prints are valued by connoisseurs. Respecting the robbery of his master, of which Huber has accused him, though we have thought it right to mention the report, we shall not very strenuously insist on the fact. Authors agree that the plates and blocks were restored after a time, and differ in the name of the robber; under such circumstances it would surely be unfair to brand with cyclopedian notoriety the memory of Antonio de Trente.

His most remarkable prints are, "The Virgin Mary embracing the Infant Christ," from Beccafumi; another "Virgin and Child," from Andrea del Sarto; "The Tiburtinian Sybil, pointing out the Saviour to the Emperor Augustus;" (which latter was printed in green ink,) after Parmegiano; a man holding a lyre; a back view of a man leaning against a bank, with a female head at some little distance; "Circe receiving the Companions of Ulysses," of the octagon form; "Psyche saluted with divine Honours," of the same octagonal shape; all of folio dimensions, and after Parmegiano; "The Martyrdom of St. Peter and St. Paul," a still larger print after the same master, is particularly mentioned by Vafari, in his life of Marc Antonio.

Nicolas Vientino, known under the name of Boldrini, an engraver on wood, was born at Vienna some time about the year 1510. Of this ancient engraver there is very little known, but it is supposed he was a pupil of Titian, from whose designs he commonly worked. There is a large upright print by him, representing Venus naked, sitting on a bank with Cupid, and a squirrel appears behind on the branch of a tree; the figures, back-ground, &c. are executed in a bold, free style, chiefly with a single stroke; but there is some cross hatching in the deep shadows. It is marked Titianus inv. Nicolas Baldrinus Vincentinus incipabat, 1566. The following are among his best engravings, which are very rare:—A portrait of Jean Baron de Schwarzenberg, surrounded with a border of warlike implements, after Albert Durer, in folio; "The Adoration of the Kings," after Titian, marked with the cypher of Boldrini; another large print of "St Jerome at Devotion at the Foot of a Rock," in a landscape; "Saint Sebastian and St. Catherine," with four other saints, of a large size; both this and the last are from Titian; a large print representing a mountainous landscape, with animals, a female leading a cow, and a young man carrying a large tub; another large print of an old ape between two young ones, entwined with a serpent, intended as a satire on the boast of Baecio Bandinelli, that his Laocoon surpassed the antique. This wood cut has been attributed to Titian by some authors, and to Boldrini by others.

To Antonio Salamanca, who was born at Rome in the year 1500, have been attributed a whole length portrait of Bandinelli; "God creating the Animal World," after Raphael, both in large folio, with some other works, which are marked with one or other of the three monograms, which will be found in our second plate of those of the *Italian School*; yet Strutt doubts whether he was the author or only the publisher of these engravings.

Giovanni Giacomo del Caraglio, or Caralius, surnamed

Jacobus

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Jacobus Veronenfis, was born at Verona in the year 1512, and died at an advanced age at Parma. Caraglio went to Rome to study under Marc Antonio Raimondi, whose style he imitated with great success, and he occupies a distinguished rank among the engravers of Italy. He was a very clever designer, and possessed great knowledge in drawing the human figure, especially the heads, which are in general very characteristic and expressive, but his draperies are not so well drawn; the folds are not broad enough, and not sufficiently varied; and most of his prints are defective in the management of the chiaroscuro. Caraglio was also very skilful in engraving gems, and executed some medals which added to his reputation.

Sigismund I. king of Poland, being informed of the merit he possessed, invited him to his court, where he lived to a happy old age, rich in royal favour, and surrounded by his friends and pupils. He commonly marked his prints with his name, and occasionally with a cypher, which will be found in our second plate of monograms of the *Italian Engravers*. The following are among his best works; "The Virgin sitting with the Infant Jesus under an Orange Tree," marked Jacobus Veronenfis; in 4to.; another quarto plate of "St. Anne, and other Saints, with the Virgin kneeling, holding the Infant Christ," marked as the former. A large folio print of "A Holy family," from the famous picture by Raphael, done for Francis I. since well known by the fine engraving of Edelinck. This one is without names, but there are proofs with the name of Caralius; another "Holy Family," after Raphael, representing the Virgin holding the Infant Jesus on a cradle, and caressing St. John, who is presented by St. Elizabeth, in folio.

F. de Poilly has engraven this subject with the inscription "Delicæ meæ esse." "The Marriage of the Virgin," from Parmegiano, in large folio. "The Annunciation of the Virgin," marked "Titiani figurarum ad Cosareni exemplar. Jac. Caraglio," in large folio. "The Supplication of Tantalus," after the same master, in large folio; "The Rape of Ganymede," after Michael Angelo: this plate is attributed to Caraglio, but it is without his name, in 4to.; a print in 4to. of an anatomical figure holding a skull in its hand, sitting on a serpent, from P. Rossi del.; "Hercules receiving the Arrows of the Centaur Nessus," likewise from Rossi, in large quarto; "Hercules killing the Robber Cacus," after the same, in large quarto; a large square folio print, representing a number of young men and women cultivating a garden, in the middle of which is a statue of Priapus, after the same painter; a set of twenty prints in 4to. representing the statues of the heathen deities, with their attributes, in niches, from Rossi. Professor Christ says of these, that "the figures or statues of the heathen deities, which appeared under his name, are not by him; I find these ancient plates come originally from James Binck." But here he is certainly mistaken; those by Caralius are dated 1526; and the copies by Binck 1530; which is four years posterior to the first publication of them.

"The Loves of the Gods," in twenty small upright plates from Perin del Vaga; a large folio plate of "The Contest between the Muses and the Pierides;" "The Death of Meleager," and "The Creation of the Universe," both after Perin del Vaga, in large folio.

Jean Baptiste d'Angelo del Moro, surnamed Torbido, was born at Verona in the year 1512. In his youth he frequented the school of Titian, but afterwards became the disciple of Francesco Torbido, called Il Moro; whom he inherited both in his name and fortune. Del Moro was both painter and engraver, and in the former art was esteemed a good colourist; his etchings are slight but spirited, and he

drew the extremities of the figure in a very masterly style. Among his works, we find fifty very fine landscapes which he engraved in conjunction with Baptista Vicentino, of whom we have before spoken, and also the following; "The Nativity," after Parmegiano, in folio; "The Virgin bathing the Infant Jesus, with the little St. John," in folio; "A Holy Family," wherein angels are ministering to the Holy Virgin and Child, an anonymous composition, but certainly after Raphael, in folio; another "Holy Family," from Raphael, in large folio; a battle piece, in large folio; "The Martyrdom of St. Catherine," from Bernardino Campi of Cremona; another large folio print, representing a shepherd, with his crook, accompanied by his dog, and visited by an angel; without names. There is a very grand composition by Julius del Moro, brother to the preceding artist, preserved in the saloon, of the grand council at Venice, entitled "Papa Alessandro terzo che dona al Doge li standardi e trombe nella Chiesa di S. Giovanni."

Marc d'Angelo del Moro was the son of Jean Baptista, and was born at the same place, in the year 1531. He studied under, and was not inferior to, his father, either in painting or engraving. We are acquainted with thirty of his engravings, which are executed with considerable ability, among which are the following.—"The Nativity, or the Adoration of the Shepherds;" "A Holy Family;" "The Adoration of the Kings;" and "The Baptism of our Saviour;" all of large folio dimensions. This artist died at Rome at an early period of life.

Æneas Vico, or Vicus, or Vighi, was born at Parma A.D. 1512. It has been supposed that he learned the principles of design of Julio Romano; and that, hearing of the great reputation which Marc Antonio had acquired at Rome by his engravings, he went to that city, and became his disciple. He was a man of talent, though inferior to his master; neither his chiaroscuro nor his manual execution are commendable; and in the latter a certain impatience of temper is but too obvious; yet he understood the human figure very well, and, when he pleased, could draw correctly. But in many of his productions the extremities are hard and heavy, and the proportions neglected. His engravings are neither so neat nor so clear as those by Marc Antonio. Indeed he succeeded best when he attempted a more open style; a good specimen of which is, a female figure, with her right arm extended, over which appears an owl flying in the air, from Parmegiano; it is a half sheet print, dated 1548.

Vico sometimes engraved on wood, and it appears that his small works done in this style are ranged among his first productions. Of this number is a portrait of Charles V. surrounded with emblematical figures, in an oval, composed with taste, very correctly drawn, and cut with great care. Upon a piece of a ruin, which serves as a tablet at the bottom, is this inscription: "Inventum scilptvmqve ab aenea vico parmen sc." But Vico was also an antiquary, and published a tract on medals, embellished with engravings by himself, and a collection of thirty-six plates of engraved gems after the antique. This artist ended his days at the court of Alphonso II. duke of Ferrara, but in what year his biographers have not recorded. Of his numerous engravings, the following will probably be found to possess the most merit.—Four medallions. Portrait of John of Medicis, in large folio, dated 1550. Portrait of Cosmo of Medicis, in his youth, in large folio. Portrait of Alphonso, duke of Ferrara. A sacrifice, in the antique taste, dated 1542, in 4to. of his own composing. A plate in small folio of the Three Graces. A Rosicrucian subject from the life of Virgil, inscribed "Virgilium eludens meritas dat semina pœnas, Romæ, 1542." "The Army of Charles V. passing

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passing the Elbe," from a composition of his own, a large upright plate, in an oval; "The Battle of the Amazons," the same, inscribed "Bellum Amazonum," dated 1543; "Vulcan working at his Forge, with Venus on a Bed behind him." In the first impressions of this plate, Mars was represented with Venus, from Parmegiano. "The Combat of the Centaurs and Lapithæ," after Rosso, in large folio, dated 1542; "The Dispute of Cupid and Apollo in the Presence of the Gods," from Baccio Bandinelli; "The School of Baccio Bandinelli," with his portrait, after Parmegiano; "The Conversion of St. Paul," after F. Salviati, all in folio; "St. George and the Dragon," from Julio Carratinus, a very rare print, in folio; "Judith with the Head of Holofernes," after Michael Angelo's celebrated picture in the Sistine chapel, in folio; "Jupiter and Leda," and a large folio print of a bacchanalian subject, both from the same master, marked Enea Vico, 1546. (This subject has been also engraven by Beatrizet.) "Christ taken from the Sepulchre," after Raphael, in folio. Another dead Christ, supported by Joseph of Arimathea, with the Virgin and other females bewailing him, a middling-sized upright plate, from Raphael; "Lucretia stabbing herself," with a Greek inscription; "Venus and Cupid," (this has also been engraven by Marc Antonio); "The Annunciation of the Virgin," a small plate from Titian. A set of vases from the designs of Polidoro da Caravaggio. A set of fifty plates, of dresses of different nations. And one of the Trojan column.

Martin Rota was a native of Sebenigo in Dalmatia, he studied at Rome, where he passed his youth, but afterwards removed to Venice, and remained there till towards the close of the sixteenth century. Huber says he was born in 1561, but this must be a mistake, since his print of "Jesus Christ meeting St. Peter," after Raphael, is dated in 1568. It is uncertain by what master he was instructed in the art of engraving; but his works prove him to have been a man of great abilities. He drew the human figure very correctly, and marked the extremities in a very masterly style.

Rota worked entirely with the graver, which he managed with great delicacy, and without dryness, though his plates are not very highly finished. Among his works is a set of portraits of the Roman emperors from Julius Cæsar to the emperor Alexander Severus, which he published at Venice in 1570. He commonly marked his prints with his name, and sometimes with the small wheel which will be found in our *Plate II.* of monograms, &c. of the *Italian Engravers*, and which constituted a sort of pun upon his family name. His principal works are as follows.—"The Last Judgment," a middling-sized upright plate, dated 1569, from Michael Angelo Buonarroti. This excellent engraving, which is justly considered as the chef d'œuvre of Martin Rota, has been copied very exactly by Leonard Gaultier; the difference, however, is easily discovered by comparison, the copy being much inferior to the original; that is, supposing the original to be a good impression. But a more striking distinction is to be seen in the face of the portrait of Michael Angelo, which is introduced in a small oval at the top; it is turned towards his right shoulder in the original, and towards his left shoulder in the copy. "The Resurrection," from his own design, dated 1577, executed in a very delicate style. Another "Resurrection" executed in a very coarse style; "The Slaughter of the Innocents," from his own design, in small folio; "Paying Tribute to Cæsar," three figures, seen as low as the knees, in folio; "The Martyrdom of St. Peter the Dominican," a middling-sized upright plate from Titian. A "Mary Magdalen," after the same master, in 4to; "Prometheus chained to a Rock," after

the same; "The Satyr Marfias slayed by Apollo;" "Our Saviour appearing to St. Peter at the Gates of Rome," after Raphael, in folio; "A Last Judgment," from his own design, a very fine plate, dedicated to the emperor Rodolphus II. dated 1573, in folio. Another "Last Judgment," also from his own design, which remained unfinished at his death, but was completed under the care of Anselm Boodt. It is distinguished from the former one, by two female figures in the middle of the picture, instead of an angel; this latter is the most rare, but the former is the finest engraving. "The Battle of Lepanto, and Defeat of the Turkish Fleet," from his own design, dated 1572, in large folio, a very rare print, as are also the good impressions of all the plates of this master.

Jerome Porro was born at Padua in the year 1520. He is not mentioned by Strutt, and very little is known of the events of his life, except that he resided for some years in the Venetian territory. He appears to have been a man of a mechanical turn of mind, and more remarkable for patient industry, than for such talent as properly constitutes an artist. Huber says, he invented and constructed a sort of sailing car, large enough to contain thirty persons, and there is yet preserved at Parma an engraved curiosity from his hand, of which it is difficult to say, whether it exhibits more patience or want of taste. The subject of this print is "The Passion of Christ," and the hatchings, which constitute the shading, are found, on near inspection with a magnifying glass, to consist of very delicate writing. Hence the chiaro-oscuro is not effective, and the writing is not legible.

Among his other works, are a set of plates for an edition of the Orlando Furioso, which was printed at Venice in the year 1548, and is now become very rare. A set of an hundred vignettes for "Les Impressi degli Uomini illustri de Camillo Camilli;" and a set of letter-press engravings, neatly executed for a book, of the funeral ceremonies of the ancients, by Thomas Portacci, printed at Venice in 1591; this was the last, and perhaps the best, work of Jerome Porro.

About the same time lived Antonio Fantuzzi, or Fontuzzi, an obscure Italian engraver, who etched a considerable number of plates in a coarse style, resembling that of Tempesta. He studied under Primaticcio, and marked his prints either with his initials, or the cypher which will be found in our *Plate II.* of the monograms, &c. of the *Italian Engravers*. Though his prints possess not much merit, rarity has conferred on them an imaginary value, and they are sought after by the curious, particularly a bacchanalian subject, where Silenus is followed by a number of Satyrs, after Rossi, dated 1543; "The Contest between the Muses and Pierides," in large folio, after Primaticcio; and, after the same master, "Alexander and Roxana," and "Alexander and Thalestris," dated 1543. A large print from the history of Psyche, of Jupiter, Minerva, &c. in an oval; and "Titan reposing on the Surface of the Sea," in folio, after Bologna.

Now also lived Andrea Schiavone, surnamed Meldolla, a celebrated historical painter, who performed some etchings somewhat in the taste of Parmegiano, and a few prints in chiaro-oscuro, among which are, "The Finding of Moses," in small folio, after Parmegiano; "The Flight into Egypt," in 4to; and "A Holy Family," in folio, after Parmegiano, in all of which the hatchings appear as if of white chalk on a blue ground; in the "Resurrection of Lazarus," the hatchings are of gold colour on a blue ground, and the same in "Christ laid in the Sepulchre," both of which are after Parmegiano; "St. Peter and St. John," after the cartoon of Raphael, is executed in the same manner, as is

also the "Rape of Helen," in folio, from a composition by Schiavone himself; for an account of whose merits as a painter, see SCHIAVONE.

Paolo Farinato was born at Verona in the year 1522, and died in 1604. He learned the first rudiments of art of Antonio Badaia, but afterwards became the disciple of Nicolo Golsino. His genius, which began to unfold itself at a very early age, inclined him to historical painting, and he continued, occasionally, to practise that art until a late period of life. A picture from his pencil, of "The Miracle of the Loaves and Fishes," adorns the church of St. George at Verona, and he painted several for the Escorial, where he passed some years.

Farinato's style of engraving was bold, free, and decided, and consists almost entirely of etching: he sometimes marked his plates, which are somewhat numerous, with his name at length, and at others with the initials P. F. or P. V. F., the V standing for his native city of Verona.

His best productions in this art are, a figure of "St. John," a small upright, a ditto of "St. Jerome kneeling;" "St. Mary Magdalen, seated with a Book and Crucifix, &c.;" "The Holy Virgin with the Infant Christ and St. John," in folio; "Angels bearing the Crosses," a small upright; "Venus and Cupid;" and "Venus at the Forge of Vulcan;" both in folio. They are all after his own compositions.

The three following engravings are by Horatius Farinato, who was the son and pupil of Paolo: he was of very promising talents, but died at an early period of life. Strutt says "he would have equalled the greatest masters;" but this may be saying a little too much. They are after his father's compositions, which may be one reason why they have generally been confounded with his works.

"The Invention of the Crosses, with St. Francis and the Holy Women," a large folio print, marked P. F. inv. Ho. F. V. fecit. 1583. Another large folio, of "The Destruction of Pharaoh's Host," marked Ho. P. F. inv. 1585, and "An Holy Family with St. John."

Giacomo Battista Fontana was born at Verona A. D. 1524. He worked at Venice great part of his life, and died in the service of the emperor. He designed as well as engraved, and we have several slight etchings by his hand, executed with the boldness and freedom of a master, though the drawing is by no means correct. Of these it may suffice to mention the following:—Several subjects from Virgil's *Eneid*, in folio, from his own compositions; "The Vision of Ezekiel," in large folio; "The Martyrdom of St. Peter, the Dominican, in a Forest," from the famous picture by Titian; (Martin Rota, and Le Fevre have also engraved from this picture.) "The Battle of Cadova, between the imperial Troops and the Venetians," a middling-sized plate, lengthways, from Titian; "Our Saviour on the Cross," in large folio; and twenty-eight small plates from the history of Romulus, including a dedication to Ferdinand, Archduke of Austria, dated 1573.

Dominico Maria Fontana was born at Parma in the year 1543. Strutt has mistakenly dated his birth in 1673. He learnt drawing in the school of Bologna, and engraved chiefly after his designs. Le Comte and others have confounded this artist with Dominico Fontana, the famous architect. The following are some of his works:—"A Flight into Egypt;" the scene lies in a mountainous landscape; "St. John preaching in the Desert," in large folio; "Our Saviour speaking to the Women of Jerusalem, on his way to Mount Calvary," in folio, dated 1584; "Mount Calvary," with a Latin and German inscription; "The erecting of the great Obelisk, before the Church of St. Peter at Rome," with all the apparatus necessary for the elevation of

such an immense mass, marked Dom. Fontana inv. Seb. Bonifacio sc. 1586, a very rare piece, engraved on three large plates.

Veronica Fontana, who engraved small portraits in wood with considerable neatness for that mode of art, was daughter to the above, and studied the art of design under her father and Elizabeth Serani.

Christofano, or Christopher Bertelli, was a native of Rimini, in the duchy of Modena, and appears to have lived about the end of the sixteenth century, though his engravings are not dated. He worked entirely with the graver, but in a stiff mannered style.

From whom he learned the art of engraving is by no means certain, and by no means important, as he neither invented a style of engraving, nor improved on those already known. He engraved after Correggio and other Italian masters; and the following are among his works: a Portrait of Octavius Farnese, duke of Parma, in folio; "The Conversion of St. Paul," a very grand composition, from Pordenone, marked "Per me Christofano Bertelli," in large folio; "The Virgin with the Infant Jesus, and four Saints," after Correggio, in folio; another of "The Virgin and Child, with St. George," from the same painter; a folio print, representing the different ages of man, marked Christofano Bertelli, sc.

Ferrando, or Ferdinand Bertelli, was of Venice, and contemporary with the preceding artist, to whose family he probably belonged; he worked after many of the Venetian masters, but did not much distinguish himself, and we therefore only mention the following of his works: "Our Saviour healing the Sick," marked Farinati pinx. F. Bertelli, exc. 1566, of large folio size; "Our Saviour on the Cross," after Julio Romano; "Venus reclining," after Titian, marked Nic. Bertelli, 1566. *Specchio della Vita humana*. In Venezia per F. Bertelli, 1566. Another, intitled "Omnium fere gentium nostræ ætatis habitus, a F. Bertellio æneis typis excus. Venet. 1569," in folio.

Lucas Bertelli, likewise a native of Venice, was a print-seller, but engraved some plates in the style of Cornelius Cort; among which are the following:—A portrait of Hippolita Gonzaga, a daughter of Ferdinand, signed Lucas Bertelli, exc. in 4to.; "The People of Israel tormented by Serpents," after Michael Angelo; a folio print of "The Baptism of our Saviour," signed as before, with four verses at the bottom, beginning "Non isti Christiani latites," &c.; another folio print of "The Magdalen washing our Saviour's Feet;" "The Flagellation," after P. Farinati, in large folio, inscribed as before; "A Crucifixion," in large folio; "The Descent from the Cross," where Nicodemus is holding the nails, a meritorious print, signed as before; "The Four Evangelists sitting at a Table in the Temple, with their Attributes," from Michael Coxie, in large folio; "The Last Judgment," after J. B. Fontana; "An old Woman and Children, warming themselves at a large Fire," with eight verses, after Titian, in folio. N. B. This engraver flourished towards the close of the sixteenth century.

Frederico Baroccio, was born at Urbino in the year 1528, and died at Rome A. D. 1612. He learnt the principles of design under Battista Franco at Venice, whom the superiority of his genius very soon enabled him to surpass. He went very young to Rome; studied with the pupils of Raphael; and, according to De Piles, was employed by pope Paul III. to paint several subjects in fresco. Baroccio painted both portrait and history with the greatest success, and particularly excelled in sacred subjects; it is said that

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he generally painted his Virgin Maries from his sister, and Infant Christs from his little nephew.

He engraved several pictures from his own compositions, which, though slight, and not well managed with respect to the mechanical part, are nevertheless most admirable, on account of the expression and excellent drawing discovered in them. His heads are very beautiful and characteristic; and the other extremities of his figures finely marked. Amidst all the difficulties he appears to have met with, in corroding his plates with the aquafortis after he had etched them, and his unskilfulness in handling the graver to harmonize and finish them, the powers of a master appear like the orb of the sun, when seen through the thin clouds of morning. The following are among his best engravings, all of which are from his own compositions. A small print of "The Virgin and Child," which was never completely finished at the bottom; "The Virgin and Infant Jesus in the Clouds," signed F. B. V. F. in 4to.; "The Annunciation," a large upright plate, of which the good impressions are very rare; "St. Francis receiving the Stigmata," a small upright plate; "The extatic Vision of St. Francis," in which our Saviour and the Virgin appear to him, a large upright plate arched at the top, esteemed the most capital of the engravings of Baroccio.

Battista da Parma, or Parmensis, was a native of Parma, born A. D. 1530. Huber, without adverting to dates, says "he was probably a disciple of Parmegiano;" now Parmegiano, as we have already stated, died in the year 1540.

The truth is, Battista studied at Rome, but under what master it is not known; and here he practised the art of engraving in a style somewhat resembling that of Cornelius Cort.

Among the most esteemed of his productions are the following:—"The Virgin and Child appearing to St. John the Divine," from Frederico Baroccio, signed Baptista Parmensis fecit. Romæ 1588, in folio; "Philippus II. Hispaniarum Rex, 1589," in large folio; "Christ baptised in the River Jordan," Bapt. Parmensis dedicavit, in large folio; "The Chastity of Joseph," in large folio, dated 1592; and "Mount Calvary," a very grand composition, marked as formerly.

Jacques, or Jacobus Parmensis, was another artist, probably of the same family, from whose hand we have a print executed in the style of Caraglio, of "The Martyrdom of St. Peter and St. Paul," and a middling-sized print lengthways, from Parmegiano; it is executed with the graver, in a slight style, and has often been attributed to Caraglio, but the heads and other extremities are not so well drawn as we find them in the works of that artist.

Gaspar ab Avibus, likewise called Gaspar Patavinus, or Padovano, was born at Padua in the year 1530. He appears to have been the pupil of George Glisi Mantuanus, whose style he imitated, but never equalled. His prints are dated from the year 1561 to 1580, and signed in different manners, sometimes with the monogram of Gaspar, which will be found in *Plate II.* of those of the *Italian Engravers*.

We shall notice the following of his productions: a print, in large folio, of "The Marriage of the Virgin Mary," from Paul Veronese, inscribed Gaspar ab Avibus Citadellensis fecit, 1577; "The Woman taken in Adultery," marked with his cypher; "The Scourging of our blessed Saviour," a large upright plate, signed Gaspar ab Avibus Citadellensis fecit, Lucie Bertelli Formis; "Our Saviour crowned with Thorns," marked as before, in large folio; "The Last Supper," from Lamb. Lombard, in large

folio; "Apollo on Mount Parnassus, with Pegasus and the Muses, Homer, and Virgil," from L. Penni; a large volume in folio, in five parts, containing the portraits of the Emperors, Archdukes, Princes, &c. of the Austrian family. Each portrait is a whole length figure, ornamented with an appropriate border. Here Gaspar has changed his usual manner of engraving, and something more of the style of the Sadeler appears in it: the figures, though stiff, are neatly engraven, and well proportioned.

Giovanni Battista Cavaleriis was born at Lagherino some time about the year 1530. He worked at Rome from 1550 to 1590. His style of engraving bears considerable resemblance to that of Eneas Vico, the disciple of Marc Antonio; though he has not, in every instance, attained the same degree of excellence.

Cavaleriis understood the mechanical part of his art very well; but his prints are defective both in chiaroscuro and drawing, particularly in the extremities of his figures. He was a very industrious engraver, and, according to the abbé Marolles, his works amount to upwards of three hundred and twenty-seven; a great part of which, however, were but copies from the engravings of other masters. He sometimes signed his prints with his name, and at others with his cypher, which will be found in *Plate II.* of those of the *Engravers of Italy*.

Among the most esteemed of his works are the Frontispiece and Heads to the "Lives of the Popes," dated 1588; the plates to a work on the "Life and Miracles of Apollinaris, first Bishop of Ravenna," in folio, which are coarsely etched, and slightly finished with the graver; "Ecclesiæ Anglicanæ Trophæa," in folio, from Nicolaum Circignano; "The Ruins of Rome," from Jean Antonio Dosius, in 30 plates; "Jesus Christ teaching among the Doctors," from his own design; "The Last Supper," from his own design; "The Statue of the Virgin of Loretto;" "The House or Chapel of Loretto, and the Miracles which were supposed to be done there," 1569; "The Celebration of the Jubilee of 1585," in the back-ground of which is a view of the cathedral church of St. Peter. (Here the engraver is called, for what reason has not been explained, Tridentinus.) And "A Naval Combat against the Turks," for the book of Ciacioni, of folio dimensions.

"The Virgin of Silence," where the Virgin is reading, and the infant St. John making a sign not to disturb the sleeping Christ, accompanied by St. Joseph, from Michael Angelo, is in large folio; "The Conversion of St. Paul," after a picture of Michael Angelo, in folio; "The Martyrdom of St. Peter," in large folio, all signed with the engraver's name; "The Apostle St. Paul," after Michael Angelo, in large folio; "The Animals returning from the Ark," after Raphael, of the same size; "Moses shewing the Tables of the Law to the People," from the same master; "The Miracle of feeding the five thousand," in two large plates; "Jesus Christ appearing to St. Peter at the Gates of Rome," with the cypher of the engraver, dated 1569; "The Battle of Constantine against Maxentius," a large upright, all from Raphael; "The Slaughter of the Innocents," after Baccio Bandinelli, a grand composition, which was likewise engraved by Mark of Ravenna; "Susannah and the Elders," from Titian, in folio, dated 1586; "St. John preaching in the Wilderness," from Andrea del Sarto; a large folio print of "The Descent from the Cross," from Daniel de Volterra. The same subject was engraved by Dorigny. "The Virgin seated on the Clouds, with the Infant Jesus and Angels ministering to her," from Livio Agresti, in large folio; "The Elevation of the Cross,"

Cross," from the same master, signed "Opus Livio Agrelli Forlivenfis, Romæ incidabat, Joan. Bapt. de Cavalleriis," in large folio.

For an account of Paul Veronese, who etched some plates about this time, and is a distinguished ornament of the Italian school, see the article CAGLIARI.

Cesare Vecellio was born at Venice some time about the year 1530, and died in the same city. He was the younger brother of the celebrated Titian, and probably the engraver of those wood-cuts which are generally attributed to that great artist. We have by this master a set of prints in octavo, etched in a free spirited style, from the designs of Titian, of the costume, or various dresses, ancient and modern, of different parts of the world: they were published at Venice in the year 1590, entitled "De gli Habiti antichi et moderni di diverse Parte del Mondo, Libri due fatti da Cesare Vecellio." In the year 1664, another edition was published, more complete than the preceding, where the title is more fully explained, thus, "Raccolta di Figure delineate dal gran Tiziano, e da Cesare Vecellio suo Fratello, diligentemente e intagliate."

Joseph Porta, otherwise called Salviati, della Grafagnano, was a native of Castelnovo Grafagnano, born in the year 1535. He was the disciple of Francis Salviati, whose name he assumed. He settled at Venice, where he painted, both in oil and fresco, with great success, and performed several meritorious engravings on wood. M. Papillon says, that he has seen twelve prints by this master, executed on wood, of which the subjects were "The Prophets," and "The Sybils," "Psyche finding Cupid asleep," and "A Chemist in his Laboratory," a print ten inches by sixteen. He continues: "But I also possess a print by this master, much superior to the preceding, of 'Jesus Christ on the Cross, accompanied by the Virgin, Mary Magdalen, and St. John,' at whose feet is a little tablet, with the name of Joseph Salviati. The characters are very admirably expressed, and the excellence of the design equals that of the execution." Porta's engraving of the Academy of Arts and Sciences, a very fine composition, in small folio, proves that in this instance Papillon is no exaggerator. Andrea Zucchi, and many other Venetian artists, have engraved from the pictures of this master, who died at Rome in the year 1585.

Julius Sanuto, or Sanutus, was born at Venice A.D. 1536, but is very little known. Among the small number of plates executed by this artist are the following: "The Birth of a monstrous Child," signed Jul. Sanutus. Venet. fec. This print is executed with the graver in a coarse heavy style, with single strokes, without any cross hatching, and bears great resemblance to a wood-cut. "Venus and Adonis," after Titian, from the gallery of the king of Spain, marked Giul. Sanuto exc. 1559; "The Fable of Apollo and Marsias," a very singular composition, from Correggio, engraved on three large plates; on the middle plate or which is introduced the Parnassus of Raphael.

Of Dominico Vitus it is only known that he was a native of Italy, born some time about the year 1536, and that he continued to engrave at least till the year 1580.

He was an ecclesiastic, of the order of Val-Ombreuse, a monastery situated in the Apennines, and was probably instructed in engraving by Agostino de Musis, whose style he imitated, and not unsuccessfully. He engraved several plates after contemporary painters, and likewise from the antique.

We have, by him, "St. Joachim holding a censer," from a design by Andrea del Sarto, dated 1580; "St. Bartho-

lomew," inscribed "Dom. Vitus Ordinis Valisumbrosa Monachus excidit, Romæ, 1578;" a set of small plates of "The Passion of Jesus Christ," surrounded with borders of birds, beasts, and fishes; several antique statues, marked "Dom. Vitus fec.;" "Jupiter and Calisto," in 4to.; and "A River God," from the antique, of the same size.

Raphael Guidi was born at Florence in the year 1540, and, judging from his works, appears to have been instructed in the school of Cornelius Cort, or Agostino Carracci. He worked entirely with the graver, which instrument he handled with much facility. He drew correctly, and the extremities of his figures are very well expressed. Though Guidi cannot be said to have equalled Carrache, yet his prints manifest that he was a man of very superior talents. The following prints are by him, and will probably be found among his best performances; "King David playing on the Harp," from Josephine, in folio (the same picture has been engraved by Eg. Van Panderen); "The Crucifixion," after Christopher Schwartz, in folio; "Jesus Christ laid in the Sepulchre," from F. Barocci, dated 1598; "Æneas carrying his Father from the Burning of Troy," from the same; "Jupiter grasping his Thunderbolts," from Polidoro; and "Vulcan" from the same master, both in folio. In larger folio, and engraved with much freedom after Josephine, is "The Fall of Icarus."

Bartolomio Passarotti was born at Bologna in the year 1540, and died in the same city A.D. 1592. It is very likely that he learned drawing in the school of Thadæus Zuccherro. Bartolomio was the most eminent of the numerous family of artists of his name, and excelled both in historical subjects and portraits. Huber claims for him the honour of having been the founder of the celebrated Academy at Bologna, where the Carracci so much distinguished themselves. He was a painter of great merit, and Ph. Thomassin, C. Cort, Aug. Carracci, and many other artists, have engraved after his pictures. He likewise produced many etchings from his own designs, and from those of F. Salviati, and P. Perugino, of which the following are best known, and probably possess most merit.

"The Virgin and Child, accompanied by St. John," from his own design, in large folio; "The Visitation of the Virgin," a rich composition, after F. Salviati, signed Bart. Passarotus fec. a very rare print, in large folio, and another large folio print of "The Marriage of Jacob and Rachael," from P. Perugino.

Marius Kartarus, or Mario Kartaro, was born in Italy some time about the year 1540, but the time and place of his death are unknown, and the events of his life are somewhat obscure. Bafan says that "Marius Kartarus was an engraver, who flourished in Italy about the middle of the sixteenth century; Rodolphus Fufeli calls this engraver Marius Cartari, who, in the year 1578, engraved at Rome the portraits of the twenty-four first Roman emperors, from Julius Cæsar to Heliogabalus. And Strutt thinks "that he was probably a German, though he resided at Rome, and learnt the art of engraving in his own country; he copied several of the engravings of Albert Durer with some degree of precision: they are executed entirely with the graver; but his principal works are etchings in a coarse, incorrect style, finished with the graver. Some of them are very large, and in general from his own designs." Kartarus commonly marked his prints with a monogram, which will be found in our second plate of those of the *Italian Engravers*, and never with his name at length. The following are among his most distinguished productions: "The Adoration of the Shepherds," in a very neat style, executed with the graver only;

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only; "Our Saviour crowned with Thorns," a large upright plate, also executed with the graver; "Diana and Endymion," a large plate lengthways; "Christ praying in the Garden of Olives," from Albert Durer, marked on a tablet 1567, Rome, in folio; "St. Jerom seated in a Chamber," from the celebrated print of the same subject by Durer. "The Descent of Christ into Hell," from Andrea Mantegna, etched in his rough style, in folio; "The Last Judgment," in large folio, from the famous picture by Michael Angelo, in which print the oval at the top, that in the original picture contains the painter's portrait, is left blank.

Andrea Andreani, called Mantuano, was born at Mantua in the year 1540, and died at Rome in 1623. He learnt the elements of his art in the place of his nativity, but went afterwards to study at Rome. Andreani engraved on wood only, in the style distinguished by the appellation of *chiaroscuro*; which he performed by the help of two, and sometimes three blocks, but never more. Among his own countrymen, he had Ugo da Carpi, and Antonio da Trento for models, whom he seems to have followed very closely in the early part of his time; but at length he carried the mechanical part of the art to a far greater degree of perfection. His great merit, as an artist, is acknowledged by all who are conversant in prints; his drawing is executed in a very masterly style, and with great spirit; the heads of his figures, though slight, are characteristic and expressive; and he has displayed great judgment in the management of the various tints.

The number of prints by this master is very considerable, for besides those which he performed himself, he procured a great many engravings by other artists, retouched them when occasion required, and, adding his cypher, sold them as his own productions. This dissingenuous artifice, altogether unworthy of him, renders it very difficult to distinguish his works precisely; for, after all, it is most likely that many prints are attributed to him, in the engraving of which he had no concern. He commonly marked his prints with one of the cyphers which will be found in our second plate of *Italian Monograms*. The Abbé de Marolles mistakenly calls this artist Andreossi; others have mistaken him for Andrea Mantegna, who lived nearly a hundred years before him, and others again for Albert Altdorfer, on account of the similarity of their monograms. We have endeavoured to exclude his adopted engravings from the following list of his works, and to select the best of his own. A portrait of Albert Durer; "The Pavement of Sienna," after a drawing by Francesco Vanni, from Domenico Beccafumi Sanese, consisting of eight subjects, said to be the most rare of all Andreani's engravings; "The Deluge," from Titian, a very large piece, on three plates; "The Army of Pharaoh passing the Red Sea," from the same; "The Adoration of the Magi," from Parmegiano, in small folio; "The Purification of the Virgin," from Salviati, in folio, dated 1608; "The Virgin and Child, worshipped by a Bishop," half figures, from Al. Caffolani, with the artist's cypher, and the words Andrea Mantuano, Pittore Sanese, 1591, in large folio; "The Virgin, St. John, and Infant Jesus, accompanied by a Saint," from Giac Ligozzio, in folio. Another folio print of "Our Saviour healing the Lepers," from Parmegiano; "Jesus Christ healing the Paralytic," from Francesco de Nanto da Sahandia, in folio; "Christ departing from Pilate, who is washing his Hands," one of his most finished productions, on two blocks engraved from a bas-relief of Govan. Bologna, in large folio; "Christ bearing the Cross," after Al. Caffolani, with the name of d'Andreani in Sienna, 1591, in folio; "The Entombing of Christ," a large folio print, dated 1591, from Giuf. Scolari Vicentino, pittore eccellente (Papillonc mentions a Joseph Scolari, an engraver on wood,

to whom he attributes many prints in *clair-obscur*). Another "Entombing of Christ," from Raphael da Reggio, a small upright plate, half figures; "St. Peter preaching," marked with the name of Polidore, and the cypher of Andreani, 1608; "St. Sebastian, with a Bishop, and the Virgin and Child, in Rays of Glory," marked Fredericus Barotius Urbinas, in large folio; an emblematical print, representing the Christian after his spiritual warfare in the present life, received as victorious into heaven, and crowned by Christ: it is signed Baptista Franco de Venise, and bears the cypher of Andreani, in large folio; a personification of human life, represented by a female figure assailed by the passions, signed Jac. Ligotus, inv. et Andreani 1585, Firenze, in large folio: there are different impressions of this plate, both with and without the *chiaroscuro*. "The Rape of the Sabinæ," from a group by the sculptor Govan. Bologna; three several views, dated 1584; another print of the same subject, from a bas-relief of the same master, on three blocks, dated 1585; "The Triumph of Julius Cæsar," from Andrea Mantegna, the original of which is at Hampton Court, it is cut on ten blocks of wood, including the title, and dated 1598; a large print of a scene in a play, intitled "Ortensio," represented by the academicians, called *Intronati*, in the presence of the grand duke Cosmo I. at Florence, from the design either of Marco Ricci, or Bart. Neroni.

Jacques, or Giacopo Palma, usually called the younger, in contradistinction to his uncle Giacomo, who was a very eminent historical painter, was a native of Venice, born A.D. 1544, and died in the same city in the year 1628. Giacopo became the disciple of Tintoretto, whose style he followed during the earlier part of his life, but he afterwards studied with great care and attention the works of Titian and other great masters, to complete his taste. Palma has etched a number of free spirited plates in a slight style, to which he frequently signed his name at length, and sometimes used the monogram of a palm-branch, crossing diagonally the letter P, which will be found in our *Plate II.* of *Italian Monograms*.

The following are by him, and are his most esteemed prints:—"Samson and Dalilah," after Jac. Franco; and "Judith and Holofernes," both middling-sized plates lengthways, marked with his name; "The Nativity," in small 4to.; "A Holy Family, worshipped by St. Jerome and St. Francis," half length; "St. John in the Desert," in 4to.; "The beheading of St. John," the same size; "St. Jerome in Conference with a Pope," in 4to. very rare; "Pallas sitting on a Trophy, holding a little figure of Victory in her Hand," in large 4to.; "Paying Tribute to Cæsar," the same; "The Woman taken in Adultery," the same; "Christ answering to the Pharisees, when they disputed his Authority," the same; "Christ appearing to St. Thomas," half length figures; "Two Men in Tartarus," the same size; "An Ecclesiastic, and a naked Figure, with two Boys underneath," with the monogram of the artist; in 4to.

Dominico Pellegrino Tibaldi, who excelled in the three arts of painting, engraving, and architecture, was born at Bologna A.D. 1546. He was the son and pupil of Pellegrino, known by the name of Tibaldi da Bologna, after whose compositions he etched several spirited plates. The following short list will probably be found to contain the best of Dominico's works on copper: "The Virgin of the Rose," after a picture by Parmegiano, in the gallery of Dresden, in folio; "A View of a Fountain at Bologna," from John de Bologna, signed Domin. Tibaldi. 1570, in large folio; "The Trinity," a grand composition, after Horace Samachini, in large folio; and a print representing "Peace,

"Peace, laying the Instruments of War at the Feet of Jove."

Camillo Procaccini was born at Bologna in the year 1546, and died at Milan in 1626. He very probably learned the principles of painting from his father Ercole Procaccini. Huber pronounces him the precursor of the Caracci, and calls our attention to the sublimity of his conceptions, and the grandeur of his taste. He resided chiefly at Milan, where he painted a great number of pictures, and died in that city at the advanced age of eighty. He amused himself much with etching, which he performed in a bold, masterly style. The heads of his figures are often admirable, and the other extremities very finely marked. Among others, the following etchings are the production of his needle:—"A Repose of the Holy Family," in which Joseph is represented in the front, a fore-shortened figure lying upon the ground, and leaning upon the saddle of the ass, a middling-sized plate, lengthways; another "Holy Family," in which Joseph is represented giving an orange to the Infant Christ, a small upright; another "Repose," where the Virgin is represented suckling the Infant Jesus, in folio; "St. Francis receiving the Stigmatics," dated 1592, in folio; (Justin Sadler has engraved the same subject.) "The Transfiguration of our Saviour," a large upright plate, of which it is very difficult to find a good impression.

Julius Cæsar Procaccini, the brother of Camillo, mentioned in the preceding article, was born at Bologna in the year 1548, and died at Milan in the year 1626. He learned the principles of painting of his father, but completed his studies under the Caracci. He excelled in historical composition, and his works are very much esteemed. He etched for his occasional amusement, but we have never seen more than a single small plate by him, of which the subject is "The Virgin and Child."

Bernardino Passeri, or Passeri, was born at Rome some time about the year 1542, and resided there most part of his life. In painting he possessed some talent, and appears to have imitated the Zuccheri, but the attitudes of his figures are, to a certain degree, forced and uneasy. In the *Abecedario* he is called an universal engraver, but for what reason is not known, unless it means, that he occasionally practised all the branches of that art which were then in vogue. It is certain that he has engraved a considerable number of prints, which, in general, he first etched, and afterwards finished with the graver, in a bold, easy, and loose style. His works prove him to have been a man of ability, but his drawing is not always correct, nor are the characters of his heads always beautiful, or well chosen. He often signed his name at length; and sometimes used a monogram, which will be found among those in *Plate II.* of the *Italian School*. The following are the names of a few of his works, which are by no means uncommon:—"A Holy Family," where the Virgin is represented with a Bohemian bonnet, dated 1583, in 4to.; "The Life of St. Bruno," represented on several middling-sized upright plates, in 4to.; and a considerable number of Holy Families, Madonnas, and other pious subjects.

Ventura Salimbeni, called Bevilacqua, was born at Sienna in the year 1555, and died in the same city in 1613. He learned the rudiments of his art of his father, Angelus Salimbeni, who was the disciple of F. Zuccheri. He was half brother to Francesco Vanni, whose style of painting he imitated; at Rome he chiefly worked in the library of the Vatican, and the church of St. John de Latran. We have several slight etchings by this artist, in a bold, masterly style, and among them the following, all from his own

compositions:—"The Marriage of the Virgin," a small upright plate, dated 1590; "The Salutation of the Virgin," in folio, 1591; a large folio plate of "God appearing to the Virgin seated in the Clouds, surrounded by Angels;" "St. Agnes," a half-length figure in 4to.; "The Baptism of our Saviour," and "Jesus Christ appearing to St. Catherine of Sienna," both in small folio.

For an account of the merits of Antonio Tempesta, as a painter, see the article *TEMPESTA, ANTONIO*. Fertile and vigorous in his invention, and various and versatile in his artificial powers, he took up the pencil or the etching point with equal facility, and almost with equal success. Though he delighted in cavalcades, battles, processions, and such other subjects as called forth his copious powers of composition, his prints are exceedingly numerous, amounting, according to Le Comte, to eighteen hundred, and according to Mariette, to no fewer than two thousand!

Tempesta's style of etching, in perfect unison with the general character of his art, was bold and free; the lights are kept broad on his single figures; his figures are often grouped with grandeur, and he possesses a certain ardent liveliness of expression, both in his human figures and animals.

From this aggregate of his merits, some deductions must, however, be made. The muscles of his horses, which frequently occur in his battles and hunting pieces, are generally overcharged; his draperies are not elegantly drawn; his lights and shades are not collected into broad masses, so as to give unity of effect to his chiaroscuro, and his etchings are often coarsely corroded, so as to destroy the clearness and value of the middle tints.

Tempesta did not always mark his prints with the same cypher. We have collected his various marks, and they will be found in our *Plate II.* of the monograms, &c. of the *Italian Engravers*. The following list is selected from the best catalogues of his works:—"Our Saviour crucified between the two Thieves," in large folio, very rare; a set of middling-sized plates, lengthways, the subjects of which are taken from the Old Testament, and commonly known under the name of "Tempesta's Bible;" a set of a hundred and fifty prints, from "Ovid's Metamorphosis," in 4to.; a folio print of "Diana and Actæon;" "The Entry of Alexander into Babylon," of the same size; a set of twenty-four pieces, entitled, "Vita S. Antonii Abbatis, &c." in 4to.; "The Labours of Hercules," in thirteen plates of octavo dimensions, comprising a frontispiece and dedication; "The Four Ages of the World," represented by the manner of living at those different periods; four hunting pieces, namely, a stag hunt, a hare hunt, a wolf hunt, and a wild-boar hunt, in octavo; another set of chaces; another set of four of field sports; two subjects of battles between the armies of the ancients, in folio; two more, of modern battles; another battle, dedicated to the duke of Gravina, dated 1600; another set of six battles, with a frontispiece, inscribed "Facunda quam sit—oliens ex. Tempesta f. de Wit ex.;" all of folio dimensions.

Of the illustrious family of the Caracci, we have already written as painters, see the articles *CARACCI LODOVICO*, *AGOSTINO*, and *ANNIBAL*. It remains to add some account of their merits as engravers, and to point out their best productions in this art to the notice of connoisseurs and collectors.

Lodovico has left us a few small prints from his own compositions. His practice was to etch his designs, and employ the graver in giving them a few finishing touches: hence his plates are slight, free, and masterly; with the extremities of his figures tolerably well defined, and still better understood;

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understood; as is sufficiently obvious to an intelligent eye. He generally marked his prints, of which we select the following as the most worthy of notice, with the initials of his name, but not combined in a cypher. "A Madonna and Child, surrounded by Angels," in 4to.; "A Holy Family, wherein St. Joseph is leaning his Head upon his Hand;" "The Holy Virgin suckling the Infant Christ;" "A Holy Family, in which the Virgin Mary is reading a Book," all in small folio; "Samson killing the Lion," in 4to.; Frontispiece to the poems of Cesar Rinaldi, and a folio print of the armorial bearings of the family of Bonfigliovoli, in which the figures of Hercules and Mercury are allegorically introduced.

Agostino Caracci was the son of a tailor of Bologna, who, desirous of educating his family in a superior manner, intended Agostino for a scholar, but a strong inclination for the pursuits of the fine arts becoming very manifest, the father was induced to alter his design, and placed his son under a goldsmith: here he learned the rudiments of engraving, for the Bolognese goldsmiths of that time were accustomed to ornament their productions with engraving, which was often executed with a degree of taste and beauty corresponding with the general existing state of art.

From this pursuit, however, the great success of his younger brother Annibal, as a painter, appears to have attracted him for a time, and he placed himself for instruction in that art under Fontana, then under Passerotti, and finally under his cousin Ludovico.

Under these masters he attained a degree of excellence in the art of painting, of which we have already spoken, but was afterwards induced, from local circumstances, with which we are unacquainted, to resume the graver, and for further improvement went to study in the school of Cornelius Cort.

The professor Fuseli says, it was "*a singular modesty* which prompted him rather to propagate the fame of others by his graver, than by steady exertion to rely on his own powers for perpetuity of name:" but he who has produced the engravings which we shall enumerate, even if he had done no more, must certainly have possessed some steadiness of exertion, could scarcely, indeed, have been "less assiduous than his brother," and might surely rely on the art which he did practise so successfully, for perpetuity of name.

The truth has been, that his great merit as an engraver remains unimpaired by time, and unimpeached by posterity, while his picture of "The Three Nymphs in the Garden Scene of St. Michael in Bosco," was nearly "in a state of evanescence," when M. Fuseli was in Italy.

Strutt says that Agostino imitated the style of Cort "so exactly, with respect to the mechanical part of it, that were it not for the great superiority which appears in the drawing of the prints of Caracci, it would be difficult to distinguish them from each other: a striking instance of which may be seen in "The Holy Family with St. Jerome," from Correggio, which was engraved by both artists."

Agostino Caracci worked entirely with the graver, in a bold free style; and his drawing of the naked parts of the figure are admirable. The heads are remarkably fine; and the extremities are marked in the most accurate and masterly manner. His draperies are frequently stiff, and crossed with a square second stroke, which gives them an unpleasing effect. But, perhaps, his greatest defect is the prevalent fault of the age in which he lived, namely, the little attention paid to the *chiaroscuro*. The lights are too much scattered, and left untinted, as well upon the distances, as upon the fore-ground

and principal objects; which not only destroys the harmony of the effect, but gives a slight unfinished appearance even to the neatest engraving. Bafan speaks of him in these words: "This excellent artist, equally versed in the sciences and fine arts, treated his engravings in so perfect a style, that one knows not which to admire most, the correctness of his drawing, or the beauty of the performance. All young artists ought carefully to observe, with what facility and perfection he expressed the extremities of his figures, and with what art he executed even landscape with the graver."

The engravings of Agostino are numerous, though their dimensions, generally speaking, are large. The following list will be found to contain those of most merit and importance. His prints are marked either with the initial letters, or some contraction of his names, but not combined in a cypher.

Portraits and Historical Prints from his own Compositions.—Anthony Caracci, the father of Agostino and Annibal, a small print, but very rare; his own portrait; Henry IV. of France, at the age of thirty-six; the emperor Augustus, en medallion, with a reverse; bust of Cosmo I., with ornamental figures; a fine female head, cited by Malvasia; portrait of a duchess with a pearl necklace; portraits of Jean Tomafo Costanzo, the princess Christiana of Lorraine, Ulysses Aldrovandus, Marc Antonio Raimondi, Titiano Vecelli, Anthony Carracci, as St. Joseph; "Adam receiving the fatal Apple;" "The Virgin and Child;" "The Virgin suckling the Infant Jesus;" "A Repose;" "The Virgin in the Clouds, with the Infant Jesus," was engraved by Marc Antonio, after Raphael; but Agostino, having got the plate into his possession, added two fine heads of Cherubs; "The Virgin in Heaven, giving the Scapulary to a Saint," a very fine engraving; "The Virgin sitting on a Step near St. Joseph and an Angel, accompanied by the Infant Christ and St. John," a large folio print, very rare; "The good Samaritan," in folio. (The impressions of this plate, without letters, are very rare; and those with the name of Bertelli are re-touched.) "The mysterious Crucifix," where a female figure represents Christianity and another Judaism, in folio; "The Resurrection of Jesus Christ," in folio; "Le Nome di Dio," representing the pope and senate of Venice supplicating the Virgin and saints to intercede for them, in an oval, surrounded with accessories, and subscribed "Luc. Bertelli formis," but without the name of Agostino, who certainly engraved it, in large folio; "The Pea-hen, with Diana en Medallion;" beneath is a landscape, with the fable of Salmacis and Hermaphrodite; and lower down in the plate are three ovals, with the dispute between Neptune and Minerva, the Three Graces, and a bust of Minerva; these are all on one plate, in large folio; the frontispiece to the book of Alde Manuce, entitled "Vita di Cosimo de Medicis," in folio. Another frontispiece, after Antonio Campi, for the book, entitled "Cremona Fidelissima," in fol. (This is a very rare book, consisting of thirty-three portraits, engraved by Agostino.) Nine plates, from Tasso's "Jesusalem Delivered," published A.D. 1590. The rest of the plates for this work were engraved by Giacomo Franco; "St. Francis receiving the Stigmatics," a large folio print; "The Girdle of St. Francis," a grand composition, representing a saint distributing the girdle of his order to different Christian sects; a large folio print of "St. Jerome kneeling at the Entrance of his Cave." There are impressions of this plate when it was about three parts finished, which are extremely rare; the remaining part is a mere sketch, marked with a very free touch. An inspection of this print shews

with what ease and vigour Augustino managed his tool. There are impressions of the same plate, quite finished, by F. Villamena, his pupil. Two landscapes, in folio, with figures; "Cupid conquering Pan," inscribed "Omnia vincit amor, 1599;" "Eternity in the Clouds, surrounded by female Figures," in folio; "Perseus in the Clouds fighting with the Sea-monster:" both this and the former one are theatrical scenes.

The following are from the Pictures of various other Masters.—"A Child blowing Bubbles," from Goltzius, very rare, in folio; "Jacob keeping the Flock of Rachael," 1581, after Denys Calvart; "Judith," a half figure, after Laur. Sabbatini, both of the folio size; "The young Tobias conducted by an Angel," from Raphael da Riggio, (it is mistakenly marked "Raphael d'Urbain"), in large folio; "The Presentation in the Temple," signed Horace Samacchini, pinx. in large folio; "The Virgin and Child giving the Keys to St. Peter, accompanied by other Saints;" Id. pinx. in folio; "The Adoration of the Kings," signed Balthazar, Peruzzi pinx. very large, engraved on seven plates; the same subject repeated, where one of the kings is kissing the feet of the Infant Christ. There are impressions of this, both with and without the name of the painter, Marco del Moro; "The Virgin and Child, with Mary Magdalene, St. Jerome, and an Angel holding a Book," from Correggio, in large folio. This picture, known under the name of the Day of Correggio, which was in the academy at Parma, is at present in the museum at Paris. "An Ecce Homo," accompanied by the Virgin and other half figures, in large folio, from the same master; "Our Saviour shewn to the People," half figures, after Vesp. Strada; "The Body of our Saviour, supported by an Angel," half figures, the same size; "The Crucifixion, or Mount Calvary," in three very large plates, from Tintoret; "The Body of our Saviour on the Knees of his Mother," from a marble group by Michael Angelo, in large folio; "The Nativity," from Andrea del Sarto; "The Virgin crowned in Heaven by the Trinity," from Aug. Mostaert, in folio; "A Holy Family," from Fred. Barroccio. Another "Holy Family, with St. John presenting a Scroll," with the words "Ecce agnus Dei," from Raphael, in folio. Another "Holy Family, with St. Michael," from Laur. Sabbatini, in folio; "The Virgin sitting in a Crescent with the Holy Infant," from the same master, in folio. Another "Holy Family," placed high in the print, with St. Anthony and St. Catherine lower down, from Paul Veronese, in large folio; "The Holy Virgin opening her Cloak to protect Two Monks," in folio. Another large folio print of "The Marriage of St. Catherine," a grand composition. A very large upright print, of "The Martyrdom of St. Justinian," on two plates, all from Paul Veronese; "The Holy Trinity, in a radiance of Glory, between Two Columns," from Titian, in large folio; "St. Paul restoring a Saint to Life," from Antonio Campi, inscribed "D. Pauli Miraculum in Neronis palatio factum;" "The Virgin and Child surrounded by Angels," from Julius Campi; "The Virgin reclining, with the Infant Jesus and St. Joseph," from Bern. Passerus, in folio; "The Virgin," a half figure, from Giacomo Francia; "St. Sebastian," in folio, from Francia; "The Virgin suckling the Infant Jesus," from Jac. Ligotius, in folio; "St. Jerome," half length, from Vann, in folio; "St. Jerome contemplating the Virgin in Heaven," in large folio, from Tintoret; "The Temptation of St. Antony," in large folio, a print which, being without the name of Augustino, has been mistakenly attributed to C. Cort.; "Mercury, and the Three Graces,"

in small folio; "Wisdom, accompanied by Peace, pursuing the God of War," the same size, both from Tintoret; and "Eneas saving his Father from the Destruction of Troy," a very large upright plate, from Barroccio.

The etchings of Annibal Caracci, the younger brother of Agostino, and author of the Farnese Gallery, are performed with all the firm confidence and fire of a master. They are held in high and deserved estimation among artists and connoisseurs, and no collection of the productions of the Italian School should be without good impressions of the following:—"Christ crowned with Thorns," from a simple and admirable composition of his own, wherein the elevated dignity, yet meek submission of the Son of God, is contrasted to the brutality of the scoffers, in a most affecting and wonderful manner. In the opinion of Strutt, and of the present writer, this is one of the very finest etchings of Annibal Caracci. It has been often copied, and in some instances tolerably well; the original is inscribed "A C. inv. et fecit. 1606." "A dead Christ on the Lap of the Holy Virgin," commonly known among collectors by the name of the "Christ du Capparolet;" "The Adoration of the Shepherds," called by the print dealers "The little Crib," from the circumstance of one of the shepherds introduced, being leaning against a manger, nearly in the middle of the composition: this also has been copied several times. The above are both of 4to. dimensions.

Of the same size are "The Adoration of the Magi;" and "Christ and the Woman of Samaria." "A Holy Family," where Joseph is seated, leaning against a column, holding a book, is a small plate lengthways; "The Virgin holding the Infant Christ and giving Drink to St. John," is distinguished by the name of "The Virgin of the Porringer," another small plate lengthways; "The Descent of the Holy Ghost," a small upright plate, nearly square; "Suffragans and the Elders," a middling-sized plate, nearly square; "Jupiter and Antiope," a small plate lengthways, dated 1592; "Silenus and two Satyrs," a small circular plate, of about eight inches and a half diameter, the border of which is ornamented with vine branches and grapes: this is commonly called the "Dish" of Annibal Caracci, having been engraved for the bottom of a salver, belonging to cardinal Farnese; "The Virgin supporting the Infant Jesus, who is asleep," in 4to.; "The Virgin of the Nightingale," where the Infant Christ is taking a bird from the hands of St. John, of the same size; "St. Jerome of the Spectacles," a half figure; a small plate of "St. Francis sitting, holding a Skull on his Knees and a Crucifix in his Hand;" another, in quarto, of "St. Francis kneeling at the Foot of a Rock, with a Disciple before him;" "Apollo playing the Lyre, with Pan, or Marsyas beside him, biting his Fingers," a very rare print, in octavo; "An old Man speaking to two other Figures," of the same size: "Venus asleep, with Cupid observed by a Satyr," in quarto; another "Venus asleep, with Cupid and a Satyr," of the same size; "The Triumph of Bacchus," in quarto: of this subject Annibal engraved a duplicate plate, as is said, with the view of instructing Lanfranc in the art of etching. "Acis and Galatea watched by a Satyr," in folio.

Francesco Caracci, commonly termed Franceschini, was the nephew of Agostino and Annibal, and was instructed in the arts of design by Lodovico. With such opportunities and strong natural talents, he in a short time attained an extraordinary knowledge of the human figure, which he drew so correctly, as to astonish his learned relatives, and Strutt thinks he might have attained a reputation equal, if not superior, to any of the Caracci: but his unfortunate propen-

Elies to debauchery nipped all these fair promises in the bud. He died in an hospital at Rome, A.D. 1662, aged only 28 years.

Franceschini etched with ability some few prints from the compositions of his uncle Annibal, among which are the following. He usually marked his work with the monogram, which will be found in our *Plate II.* of the *Italian Masters*:—"The Madonna and Child seated on a Cloud;" "St. Charles Boromini kneeling before a Table, contemplating a heavenly Light;" two plates of "Angels teaching the Lesson of Mortality," of which our art it himself was so heedless; a set of four plates of illustrious women of antiquity: namely, "Semiramis," "Lucretia," "Artemisia," and "Portia." These latter are after Lodovico Caracci, and are very rare, and all his prints are of small dimensions.

Of that distinguished engraver Cherubino Alberti, who was living at the period now under our review, we have already detailed the biography, and descanted on the leading traits of his excellence, under the article ALBERTI CHERUBINO. His monogram will be found in our *Plate II.* of those of the *Italian School*; and we are now enabled to render our select list of his performances somewhat more copious, by the addition of the following:—the Portraits of Pope Gregory XIII. in an oval, with accessory ornaments; Pope Urban VII. companion to the above; Henry IV. of France, also in an oval, with accompaniments; and Pietro Angelo Bargeo; all of folio dimensions, and from pictures by Cherubino himself.

Historical Subjects from his own Compositions:—"Judith, with the Head of Holofernes, and a Sword," in folio; "The Nativity," a grand composition, dedicated to Pope Clement XII. inscribed "En Deus Omnipotens," &c. both in folio, and marked with his cypher;" "The Flight into Egypt," where the ass is led by an angel, accompanied by St. Joseph and Elizabeth, in large folio; another folio print of "The Virgin and Child with St. Joseph," signed with Cherubino's cypher; "The Body of our Saviour, carried through the Clouds by two Angels," inscribed "Magnum pietatis opus," &c. in folio; "The Virgin and Child in the Clouds, surrounded by Cherubims' Heads, and two Angels strewing Flowers," entitled "Regina Cœli," in folio; another folio plate, of "St. Catherine of Sienna stigmatized, and supported by two Angels," 1574, marked with the artist's cypher; "St. Christina and St. Francis stigmatized, accompanied by two Angels," 1599; "St. Charles in the Clouds surrounded by Angels, prostrating himself before the Virgin and Child," 1612, all of folio dimensions; six subjects for ceilings, of children, after the pictures by Alberti, painted at Tivoli; six genii in the air, dedicated to Cardinal Visconti; the first is inscribed "Ex picturis, quas Cherubinus Albertus in ejus Villa Tusculana pinxit, has ipsemet incidit, 1607," in large quarto.

Historical Subjects from various other Masters:—"Standing figure of "Susanna leaning against a Pedestal," on which is written, S. Susanna Vir. & Mart.; lower down, Alexander Albertus inv. dedicated to Cardinal Rustici, in large folio; "Our Saviour on the Cross," to the left is the Virgin, to the right St. John with extended arms, from Michael Angelo, in folio; a large folio print of "St. Jerome sitting meditating on a Cross," from the same master, engraved at Rome, A.D. 1575; another in folio, of "St. Andrew bearing a Cross," engraved in 1580, and taken from the Last Judgment of Michael Angelo; two other figures, in folio, from the Last Judgment, one inscribed "Nuda Veritas," the other, "Petit ad Æthera:" these are very fine engravings, and dated 1591; the figure of Charon, accompanied by

two others, and some heads, from the same Last Judgment, engraved A.D. 1575, in folio; "Prometheus torn by the Vulture," painted for an angle of the Sistine Chapel, in folio, engraved A.D. 1580; a group of four figures, namely, "The Body of Our Saviour;" "The Virgin;" "Nicodemus;" and "Mary Magdalen;" in folio. The original sculpture by Michael Angelo, from which this engraving was made, was taken to Florence, and placed behind the altar of the cathedral, with the following inscription: "Postremum Michaelis Bonarotæ opus, quamvis ab artifice ob vitium marmoris neglectum, eximium tamen artis canon. Cosmus III. Magnus Dux Etruriæ Romæ jam æreum hic. P. I. anno MDCCXXII." Three prints representing "The Creation of Adam and Eve;" "Adam and Eve chased out of Paradise;" and "Adam and Eve subjected to Labour," Rome, Polidoro de Caravag. invent.; a large frieze, of "The Death of the Children of Niobe," in five plates; another frieze, of "The Rape of the Sabines," with a Latin inscription; "The Triumph of Camillus," in the antique taste; "Pluto," a figure holding a flambeau; "Fortune," with her left foot on a wheel; "The Presentation in the Temple," from Raphael: it was published after the death of Alberti, in folio; "The Resurrection of Christ," a grand composition, with an angel sitting before the door of the sepulchre, dated 1628, in folio; "Jesus on the Mount of Olives," where an angel presents him with a chalice, dated 1574, and published in 1628, in folio, from Rosso; this, as well as the last, was published after the death of our engraver. "A Holy Family," in large folio, after Raphael, engraved in 1582; a folio print of "Jupiter caressing Ganymede," from the Vatican, by Raphael; two more from the Vatican, on the same plate, of "The three Graces;" and "Venus quitting Juno and Ceres," 1582; "The Adoration of the Magi," a grand composition, after Rosso, dated 1574; "The Transfiguration," marked with Alberti's monogram, from the same master, 1574; "St. Stephen stoned," an architectural design for a grand tabernacle, on two plates, Rome 1575, in folio, all from Rosso; "The Baptism of our Saviour," after Andrea del Sarto; "The Miracle of St. Philip Beniz-zio," where those who had despised his exhortations were struck dead with lightning, from a picture by Andrea del Sarto, 1582; a folio print of "The Guardian Angel conducting the youthful Tobias," from Pellegrino Tibaldi, 1575; "Our Saviour in the Garden of Olives, with his three Disciples," engraved by Perin del Vaga, and Ch. Alberti, in folio; "The Nativity, or the Adoration of the Shepherds;" over head is a glory of angels, inscribed "Gloria in Ecclis," in large folio, on two plates, from Thadeus Zuccherro; another "Holy Family," where the Virgin holds the Infant on a cradle, from the same master; "The Flagellation," from a picture by T. Zuccherro, in the church of the Consolation at Rome, in folio, dated 1575; "The Conversion of St. Paul," a grand folio print, from the same master, dated 1573; "The Body of our Saviour in the Arms of God the Father, surrounded by Angels, with the Instruments of the Passion," from the same; "The Assumption of the Virgin," engraved in 1577, from T. Zuccherro, and dedicated to pope Theani, in large folio; another Assumption, a large print from T. Zuccherro, engraved in 1571; "The Virgin crowned in Heaven," from the same master, engraved A.D. 1572.

We have already treated of the biography and merits of Lodovico Cardi, surnamed Civali, both as an engraver and painter. (See the article CARDI LODOVICO.) His monogram will be found in our *Plate II.* of those of the *Italian School*.

Christopher Lederer was born at Nuremberg in the year 1560. He travelled to Italy in his youth, for the sake of studying the arts to advantage; and here, for some reason which has not transpired, he changed his surname for that of Coriolano, or Coriolanus. He resided at Venice for some years, where, according to Vafari, he engraved on wood a set of portraits of celebrated artists, a work which other writers have still more mistakenly ascribed to his son.

Now as these portraits first appeared in the year 1568, if Christopher was born in 1560, as Huber reports, and Bartholomew not until 1590, they could not have been engraved by either of the Coriolani. Again, he is said to have engraved for the anatomical work of Vesalius, of which the drawings were supplied by Titian, but as this celebrated book first appeared in 1542, Lederer's blocks must have been for some subsequent edition, if he cut them at all.

It appears much more certain that he engraved the figures for Ulysses Aldrovandini's work on natural history, and for another book, entitled "*Ars Gymnastica*," &c.

Bartolomeo Coriolano was the son of Christopher, and was born at Bologna in the year 1590. He learned the rudiments of art in his father's house, but finished his studies in the Bolognese academy.

In return for the dedication to pope Urban VIII. of a capital work which he engraved on wood, after the Caracci, Guido, and other great masters, that pontiff bestowed on him a pension, and the order of knighthood. According to Papillon, our artist pretended to be a descendant of Caius Martius Coriolanus, the great Roman general, but this is most likely a mere joke, fabricated on the occasion of his military, or equestrian title.

He likewise engraved in clair-obscur, and his productions in that style are very much esteemed by connoisseurs. He had a good taste in design, his heads are finely characterized; and the other extremities of his figures are very well marked. In general he used no more than two blocks of wood; on the first he cut not only the outlines, but the darker shadows in imitation of hatching with a pen; the second served for the half tints; and with these two blocks, judiciously managed, he produced a pleasing effect. He signed many of his prints with his name at length, and the addition of the word *Eques*, which is known to be synonymous with knight. The following are among his most esteemed productions: "St. Jerome meditating before a Crucifix," a small upright print from Guido; this is engraved on three blocks of wood, and inscribed "Barthol. Coriolanus, *Eques*, sculptit, Bonon. 1637;" "Herodias with the Head of St. John," also in clair-obscur, and from Guido; "The Virgin and Infant Jesus, asleep under Drapery," on wood, from Guido; the same subject, in clair-obscur, very finely executed, both in 4to. and marked Barthol. fec. 1630; another "Virgin and sleeping Christ," from F. Vanni, in clair-obscur, not marked, in large 4to.; "Peace and Plenty," from Guido; "A Sybil sitting, holding Tablets," both in 4to.; "The Fall of the Giants," a large upright print, on four separate sheets which paste together, in clair-obscur, "The Seven Wise Men transported to Bologna," in large folio.

Theresia Maria Coriolano, was the daughter of this artist, and learned engraving of her father, and painting of Elizabeth Sirani. We only know of a single etching by her, of "A Virgin and Child," half figures.

Giovanni, or Jean Batista Coriolano, was brother to Bartholomew, and was born in the year 1596, in Bologna; where he became the scholar of Valisio, a painter of some eminence.

As a painter, Batista never acquired any great degree of

reputation, but he engraved both on copper and wood, his works on the latter material being however greatly superior to his engravings on copper. The following may be reckoned among his best productions: a portrait of Vincent Gualdi; another of Fortunatus Licetus; another of Joannes Cottinius, Patricius Verienfis, Coriolano, fe. all of quarto dimensions; the statue of the Virgin in a palm-tree, commonly styled "Our Lady of the Palm," before which is a small altar: "The Miraculous Image of the Virgin," from Guido; "Christ crowned with Thorns," from Lodovico Caracci; "A sleeping Cupid," in chiaroscuro, very rare, after Guido; a triumphal arch in honour of Louis XIII. in folio; "Paul Macii Emblemata," being a set of eighty-three prints, of which twenty-seven are by Coriolano, and the rest by O. Gatti, and A. Parisini.

Giovanni Luigi Valesio, was born at Bologna in 1561. There were two other engravers of this name, who lived some time about the same period, and probably belonged to the same family; but as their productions have nothing remarkable to recommend them, we will pass them over in silence. Giovanni frequented the Bolognese academy, and has engraved several things in a good taste. Most of his prints consist of allegorical and emblematical designs, frontispieces for books, and other ornamental plates; some of which he marked with a monogram, which will be found in our *Plate II.* of those of the *Italian Engravers*. The following are among his most esteemed productions: "The Virgin with the Infant Christ seated on her Lap," a small upright plate; "Venus threatening Cupid," and "Venus chastising Cupid," its companion, two small upright plates; "Hymen with two Lions at his Feet," and "A Group of Genii," from Lodovico Caracci, in folio.

Jean Frederic, the son of Matthew Greuter, of Strasbourg, was born at Rome some time about this period. Our countryman, Strutt, has entered into rather a lengthened argument with the foreign writers respecting the date of Jean Frederic's birth, of which his merits as an artist do not appear to render him worthy. What does it signify when or where men are born, who are possessed of no greater talent or taste than this engraver? or whether or not there was a Frederic and a Jean Frederic also?

The son of Matthew Greuter, of whom we have given some account in our *GERMAN School of Engraving*, resided at Rome, being educated to the profession of engraving by his father. Here he engraved a considerable number of plates with commendable industry, working with the graver only; but he neither drew well, nor possessed feeling for art that might in any degree supply the place of drawing; yet his prints, of which we shall only mention a few, are sometimes sought after by the curious. "Hercules in the Garden of the Hesperides," from Pietro da Cortona; "The Forge of Vulcan," after Lanfranco; and "A Battle," from Tempesta, both in large folio. "The Death of St. Cecilia," after Dominichino, a large plate, nearly square. An emblematical subject relative to the progress of Christianity, a large folio print, from Romanelli; and "A Madonna and Child, with St. Francis kneeling," from a composition by himself, arched at the top, of folio dimensions, and dated 1623.

He also engraved several portraits, and other subjects from Guido, Vouet, Stella, And. de Ancone, and other masters.

Francesco Vanni, a very celebrated historical painter, was born at Sienna A.D. 1563, and died in the same city in 1610. He was first the disciple of Salimbini, afterwards of Passarotti, and at last of Giovanni de Vecchia; though in preference

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preference to all these, he adopted the style of Fred. Baroccio. We have four small etchings by him: the spirit, beauty, and correctness of drawing that appear in those prints, makes it to be regretted that he etched so little. The subjects of these etchings are as follow: "The Virgin contemplating the sleeping Christ;" "St. Catherine of Sienna receiving the stigmata, or Brand;" "St. Francis receiving the Stigmata;" and "The Extatic Vision of St. Francis," the saint is a half figure, and an angel appears above playing on the violin. Huber says that the beauty which is discoverable in this print cannot be too much admired. Agostino Caracci engraved from the same design, with some variations.

Giovanni Maggi, or Magius, was born at Rome in the year 1566, and is better known as an engraver than as a painter; we have by him many slight etchings, which are not worthy of any very great commendation. In 1618, he published a collection of all the principal fountains in Rome, which he engraved in conjunction with Domenico Parafacchi. He undertook to engrave, on a very large scale, the plan of Rome, with all the streets and principal buildings, &c. but wanting money, the enterprise was never performed by him. We have by him, the portrait of a cardinal, as large as life; a landscape, with figures, ruins, &c. inscribed "J. Maius, v. et fec. 1595;" and "Figura della Vita Humana, Joh. Maius fec. 1600," in large folio.

Francesco Villamena was born at Assisi, a city of Italy, in 1566, and died at Rome in 1626. He went to Rome under the pontificate of pope Sixtus V. and studied the best pictures and statues there. He studied engraving under Cornelius Cort and his scholar Agostino Caracci, with whom he was contemporary. Villamena drew with considerable ability; he engraved in a bold open style, and produced a clear but not powerful effect; his lights, though broad, are too much spread over the whole engraving, which makes his prints appear unfinished. But this defect was common to the artists of that age, and these faults in the prints of Villamena, are amply compensated by the beauties with which they abound, particularly with regard to the expression of the heads, and the excellency of the drawing. The extremities of his figures are also very finely marked. Some of the engravings of this artist are performed almost entirely with single strokes, without any cross hatchings laid over them; and it was perhaps from them that Mellan originally took the hint, which afterwards became the marked peculiarity of his style. The number of Villamena's prints is very considerable: M. Mariette mentions three hundred and sixty; and he marked them either with his name, initials, or monograms, which will be found in our *Plate II.* of those of the *Italian School*, we shall mention the following, from his own designs; a portrait of cardinal Cæsar Baronius Soranus, in folio; and four other portraits of men of rank; "St. Theresa in her Cell writing, under the Inspiration of the Holy Ghost," in folio; "Mary Magdalen penitent in the Desert, crowned by an Angel," in 4to.; "St. Francis praying before a Crucifix," in folio; a set of six grotesque little figures, one of which is a beggar, accompanied by two children; a set of five saints, three of which are from his own design, and the two others from Ferrau Franzoni, in small folio; "St. James, appearing in the Air, to the Army of Ferdinand," a very grand composition; "A Man, angered by a Crowd of People, fighting in his own Defence;" a large print lengthways, commonly called *The Boxers*; a middling-sized plate, in which is represented John Alto, the antiquary, standing in one of the streets of Rome. The following prints are

From various other Masters. — "Moses exalting the Brazen

Serpent," from Ferrau Franzoni; "A Holy Family, with St. John, Elizabeth, and St. Ann," a middling-sized upright plate from Raphael, dated 1602. Villamena repeated this subject, and dated the second print 1611. "The Salutation of the Virgin," a large upright plate, from M. Arcenio; "The Virgin and Infant Jesus worshipped by St. Francis;" "St. Bruno, with his Companions, doing Penance in the Desert," a large plate lengthways from Lanfranco; "Christ taken from the Cross;" a large folio plate, arched at the top, from Baroccio; another "Annunciation of the Virgin," a grand composition from Hipp. Andreasius, in large folio; "The Presentation in the Temple;" a middling-sized plate lengthways, from Paulo Veronese; "St. Bernard, and the Virgin in the Clouds," after F. Vanni; "Alexander at the Battle of Arbella," from Ant. Tempesta; a large plate, lengthways, representing "Hercules holding the Globe, with the armorial bearings of Cardinal Arigoni," from Albano; another subject of the same kind with the arms of Cardinal Barberini; the same subject with the arms of Spain, all which are of large folio dimensions; the bible of Raphael in twenty plates, fifteen from the Old Testament, and five from the New, intitled "La sacra Genesi figurata da Raffaele, intagliata da Francesco Villamena, dedicata al Cardinal Aldobrandino, Rom. 1626."

Leonardo Norfini, who assumed the name of Parafole, from its being the family name of his wife, was born at Rome in the year 1570, and died in the same city, at the age of sixty. He was an engraver on wood of some merit, and was much employed by A. Tempesta. At the command of pope Sixtus V. he engraved the plants, &c. for the herbal of Castor Durante, the physician of that pontiff.

The figures in Norfini's engravings, after Tempesta, are correctly drawn, and executed in a finished style, for that mode of art.

His son, Bernadino Norfini, likewise engraved on wood; he frequented the school of Josephine, and began to make some progress in painting, when he died at an early age.

Isabella Parafole, the wife of Leonardo, was a woman of great ingenuity, and composed a book of patterns for lace and embroidery, of the prints in which she engraved on wood. She likewise did a great number of plants for a herbal of prince Cesi of Aqualparta.

Jerminica Parafole, a lady of the same family, equally distinguished herself by engraving on wood; and there is by her hand a large print of "The Battle of the Centaurs," from A. Tempesta; it is coarsely executed, though with much spirit; but the drawing is not correct.

Odoard, or Edward Fialetti, was born at Bologna A.D. 1573, and died at Venice in 1638. He learned the rudiments of design of J. B. Cremonini, but afterwards travelled to Venice, and finished his studies in the school of Tintoretto. He was an historical painter as well as engraver, and his works in both arts are spoken of with the warmest commendation; Boscchini mentions thirty-eight pictures by Fialetti, which he painted for churches and other public buildings in Venice. He etched a great number of plates as well from his own designs, as from those of other artists.

His etchings are executed in a slight, but masterly style. He drew correctly, frequently selected or invented very graceful attitudes, and composed his figures with much taste. If he had left no other testimony of his merit than his prints, they would have been sufficient to prove that he was a man of very great ability. He generally marked his prints with a cypher, which will be found in our *Plate II.* of those of the *Italian School*. We shall mention the following productions of his graver, as well worthy of the notice of the connoisseur. A long frieze from his own composition of tritons, sirens,

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firens, dolphins, and other marine chimera; "The Marriage of Cana in Galilee," a middling-sized plate lengthways, from Tintoretto; four subjects from Le Pordonone, "Venus and Cupid;" "Diana at the Chase;" "The God Pan;" and "A Man holding a Vase;" "The Pastimes of Love," a set of twenty small upright plates, from his own designs; entitled "Scherzi d'Amor espressi da Odoardo Fialetti, pittore in Venezia;" a book with studies for drawing, in folio, published at Venice A.D. 1608: a book of the costumes of different nations; and another of antique friezes, after Polifilo Ziancalei.

Guido Reni, the celebrated historical painter, was born at Bologna in the year 1575, and died in the same city in 1642. He learned the elements of drawing of Denis Calaveart, whom he quitted, to study in the Bolognese academy. But of his great talents as a painter we shall treat under the article *RENI*, and have only to notice him here as an engraver.

There are a great number of prints by his hand, which are etched in a bold, free style. His heads are beautiful and expressive, and the other extremities are drawn with all that taste and judgment which might be expected from so great a master; though they are very slightly executed, their intrinsic beauty, and the vigorous but discriminating intention of the artist, which is every where apparent to the eye of taste, have stamped a high value on them, which they justly deserve. Simon Cantarini, called Il Pefarese, copied the style of etching of Guido with so much precision, as sometimes to deceive the eye of the unwary connoisseur; but in general, the extremities of the figures in the plates of Cantarini, are not marked with that admirable taste so discernible in the works of Guido.

He sometimes marked his plates with his name, or monogram, which is among those of the Italian engravers in our *Plate II*. The following are among the productions of his hand, the whole number of which, according to Mariette, amount to two hundred and eighty-nine.

From his own Companions.—A bust of pope Paul V. in oval, very rare; the profile of a man; another, with a long beard; "The Virgin with the Infant Jesus, with St. Joseph in the back ground," in 4to. one of the finest engravings of Guido; "The Virgin with the Infant Jesus asleep at her Breast;" a subject which Guido has treated in three different ways; another "Virgin and Child, with a Book;" the only plate which Guido has executed entirely with the graver; three other holy families, represented in different ways; "St. Christopher, with the Infant Jesus on his Shoulders, going over the Sea;" "St. Jerome praying before a Crucifix, in his Cave," in 4to.; "Cupid contemplating a female Figure, who holds a Compass and Tablet;" "Two Children carrying a third on their Shoulders," in 4to.

The following are after other masters: "A Glory of Angels," after Lucas Cambisi, in folio. This print is reckoned Guido's master-piece. "The Entombing of Christ," a middling-sized upright plate, from Parmegiano, a very fine print; "The Infant Christ sitting on his Mother's Lap, laying his Hand on the Tabernacle, with St. Joseph," from Aug. Caracci, falsely attributed to Annibal, in 4to.; "The Virgin Mary suckling the Infant Jesus," from Caracci, in 4to., executed on a blank ground; "The Charity of St. Roch," dated 1610, in large folio. These are the principal engravings of Guido, of the whole of which Adam Bartsch of the library at Vienna has given a very good catalogue.

For an account of Franciseo Brizzio, the pupil and assistant of Agostino Caracci, see the article *BRIZZIO*; and

for the biography of Horace Borgiani, who lived also at this period, see *BORGIANI*. The monogram usually affixed by the latter to his engravings will be found in *Plate III*. of those of the *Italian School*.

Raphael Scaminosi, or Schiaminosfi, was born at Borg S. Sepolcro in the year 1580. He was the disciple of Raphael dall Colle. He performed some few engravings on wood; and there are a considerable number of etchings by him,—Florent le Compte says a hundred and thirty,—which are executed in a bold dark style. There is a coarseness in them, which gives them a disagreeable appearance at first sight; but on examination, they will be found to possess great merit. His knowledge of drawing seems to have been very extensive; and the characters of his heads are striking and appropriate. His monogram is copied in *Plate III*. of those of the *Italian School*.

The following are some of the best productions of his needle: "The Virgin and Child," a middling-sized upright, inscribed "Raphael Schiaminosius, Pictor ex Civitate Burgi Sancti incedebat, A.D. 1633;" "St. Francis preaching in the Desert," from his own composition; a set of the twelve Apostles; a set of fourteen small plates, lengthways, intitled "Mysteria Rosarii beatæ Mariæ Virginis," published at Rome, 1609, all from his own designs; the fifteen Mysteries of the Rosary, in folio; "The Martyrdom of St. Stephen," a middling-sized plate, lengthways, from Lucas Cangiagi; "Mary Magdalen carried away by Angels," after the same, in folio; "The Visitation of the Virgin," from Barroccio, in folio; a middling-sized plate, lengthways, from the same master, of "A Repose;" "The Holy Virgin in the Clouds, with St. Cecilia, and another Saint," from P. Veronese, in folio; "The Virgin Mary on a Globe, surrounded by Angels," from B. Castelli, in folio; a set of twelve wood-cuts of the twelve Apostles; another set of portraits of the first twelve Cæsars, from Tempesta, also engraved on wood.

Jean Lanfranc. This distinguished artist was born at Parma A.D. 1581, and died at Rome in 1647. He first studied under Augustino Caracci; but on the death of this master, went to Rome to complete his studies under his brother Annibal, where he was knighted by pope Urban VIII.

His merit as a painter will be treated of under the article *LANFRANC*. We shall speak of him here only as an engraver.

The mode of art which he practised was etching, and his etchings, though hasty productions, possess merit. He commonly marked his plates with his name, or initials, but not combined in a cypher; and his most esteemed prints are mentioned in the following short list: "The Triumph of a Roman Emperor," in large folio; "An Emperor haranguing his Soldiers," the same; the Bible of Raphael, from pictures in the Vatican, engraved in conjunction with Sisto Badolocchio, (of whom we shall next proceed to speak,) and dedicated to Annib. Caracci, 1607, in 4to.

Sisto Badolocchio was of the family of Rosa, born at Parma in the year 1581, and died at Rome in 1647. He was the contemporary and fellow-student of Lanfranc. There are some picturesque little etchings by him, in which we discover correctness of design, and facility of handling his tool. He marked his prints, of which those that follow are held in most esteem, Sisto B. "The Statue of the Laocoon," from the antique, in large folio; "The Apostles and the Angels, with the Chandeliers of the Cupola of Parma," from Correggio, six plates in folio; "A Holy Family, with St. John," a small upright plate of half figures only; Raphael's Bible, from the pictures of

Raphael

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Raphael in the Vatican, small plates, lengthways, engraved conjointly with Lanfranc.

Octavius Leoni was born at Rome in 1582, and, under the instruction of his father, he acquired some degree of excellence as a painter. As an engraver, he is believed to have been self-taught; for, excepting the hints which he might have borrowed from Boulanger and Agostino of Venice, he imitated none of his predecessors. There are a set of twenty portraits, chiefly of distinguished artists, from his hand, engraved in a singular and striking manner. The hair and draperies are executed with strokes; the flesh is done in round dots; and the dark parts of the eyes and sharp shadows being assisted with strokes, which are managed in a skilful manner, produce a pleasing effect. These heads are finely drawn, and some of them finished in a much higher style than is usual with painters, when they take up the point or the graver. The following are among the portraits: Eques Ottavi Leonus, Lodovico Leonus, Johannes Franciscus Barbeiri, Marcellus Provenzalis, Eques Christophor Ronchalis de Pomerancis, Eques Joseph Cesar Arpinas, Antonius Tempelta, Thomas Salinus, Don Antonius Barberinus, Pierre Jacopo Martello, a poet, whose portrait is adorned with pastoral allusions.

Remigio Cantagallina was born at Florence in 1582, and died in the same city A.D. 1624. He for some time frequented the school of the Caracci, but afterwards learned engraving of Julio Parigi. Remigio drew extremely well with a pen and ink, and sometimes, with great good sense, imitated this mode of art in his etchings.

His etchings are chiefly after his own designs, though he sometimes engraved after other masters; and it is no small addition to the fame of this artist, that Callot and Della Bella were his pupils. The cypher which he commonly used is copied in *Plate III.* of the monograms of the *Italian School*. We shall specify the following of his works: "The Assumption of the Virgin, wherein she is crowned by two Angels," in 4to., after Callot; four small landscapes, dated 1609, from Rossi; a set of six landscapes; another set of twelve, in octagons, with the cypher of the artist; another set of six; another set of nine and twenty prints, the scenes of an opera; and the representation of the fête given on the Arno, at the marriage of the prince of Tuscany, from the designs of Julio Parigi, in folio, 1595.

We now approach two artists, both of them disciples of Cantagallina, of a very different kind from any of their predecessors, of more enterprising spirit and more original powers, if not of more vigorous intellect, than the schools of Italy have yet presented to our notice: but having already treated of the biography and professional merits of Callot and Della Bella. (see the articles *BELLA* and *CALLOT*.) before our classification of the engravers into the several schools of Europe was determined on, we can do little more in this place than add more copious lists of their very estimable engravings.

The number of Callot's engravings, considering the short period of his life, is not less wonderful than the various multitudes of figures by which some of them are peopled. The best catalogue with which we are acquainted is contained in the third volume of the Baron Heinekin's Dictionary, from which we have extracted the principal, in conformity with our plan.

Subjects from Holy Writ, and the Monkish Legends.—"The Passage of the Red Sea," in 4to. of which connoisseurs are desirous of possessing each of the two different states in which the plate was printed. "Elias and the widow of Sarepta;" "Ecce Ancilla Domini," or "The Annunciation," after

Matteo Roselli, in 4to. This is a rare print, and is distinguished from another of the same subject, called "The little Annunciation," as well by its being without the engraver's name, as by its Latin inscription. "St. John preaching in the Desert," 4to. "The Parable of the Husbandman sowing Seed," with a Latin inscription, 4to. This plate is solely the work of the graver. "Ecce Homo," after Stradan, folio, engraven at the age of eighteen. "Christ bearing the Cross," a small oval, engraven on a silver plate. "The Crucifixion, with the Virgin Mary, St. John, and Mary Magdalen, embracing the Cross," a small and rare print. "The Entombing of Christ," after Ventura Salimbini, the work of the graver alone. "Our Saviour with the Disciples at Emaus." "The Virgin Mary with the infant Christ," an oval. Another, wherein the Virgin is embracing our Saviour, 4to. Another of the Virgin, after Andrea del Sarto, wherein is introduced St. John and Elizabeth, 4to. Another, after P. Farinati, with the infants Christ and St. John, folio. "Our Lady, with three Ears of Corn," 4to. "A Holy Family," inscribed "Minor servi et majoris, &c." 4to. Another Holy Family, after Sadeler, in 4to. entirely performed with the graver. "The Assumption with the Cherubim," 8vo. There is another of this subject, called "The little Assumption," in an oval. "Benedicite," another Holy Family, 4to. "The Triumph of the Virgin," folio, dedicated to Charles IV. duke of Lorraine, and Bar. folio; "St. John the Evangelist in the Isle of Patmos," in 4to. nearly square; "St. Francis:" of this subject there are two engravings, one known by the name of "The little St. Francis of the Tulip;" and the other termed "The Tree of St. Francis," at the foot of which are several monks at prayers, 4to. nearly square; "The Temptation of St. Anthony," the first plate of this subject, (which is a large folio,) is dedicated to Monf. Philippeaux de la Vrilliere, beneath it are Latin verses with his coat of arms, and it is dated in 1635.

As Fuseli has painted three pictures from the same fairy scene in Shakspeare's *Midsummer Night's Dream*, so Callot, to shew that his imagination was far from being exhausted on the subject of the temptation of St. Anthony, has engraved a still larger plate from this celebrated legend, which is very considerably varied from that of which we have spoken; and, though not the best, the second is by much the scarcest print of the two; for the plate, having been materially damaged by accidental contact with some acid, a good impression, before the accident, is now rarely to be met with. "The Martyrdom of St. Lawrence," a small oval; "The Martyrdom of St. Sebastian:" this is a large and grand composition, in form of a frieze. "St. Nicholas preaching in a Wood;" "The Miracle of St. Manfuette:" this is reported to be the earliest of Callot's etchings, it is in folio, and the shadows are expressed by broad and coarse hatchings, and almost, if not quite, every line in it is re-entered with the graver. St. Manfuette was a bishop of Tours, who is here represented as restoring to life the son of king Leucorus, who had fallen into a river in reaching for his tennis ball. "The twenty-three Martyrs of Japan," in 8vo.; "The Infant Priest, or carrying the Host," a small plate, for which Callot himself is said to have entertained so great partiality, that he occasionally wore it, as some of the foreign orders of nobility are worn, suspended from a button hole of his waistcoat. The proofs which were taken before the plate was perforated to admit the ribbon or string are rare, and are esteemed valuable among connoisseurs. "A Nun kneeling before a Crucifix," in 4to.: this piece is known by the name of "Santa Teresa," but it appears from the inscription that it is the portrait of Marie Victoire, the foundress of the

convent

convent of the nuns of the Annunciation, at Genes, who died Dec. 15, 1617. "The Possessed," or the Exorcism, after And. Boscoli, in folio, entirely the work of the graver. "The Course of Human Life," after Bernardino Poutti. This is a set consisting of four plates, which are vulgarly called Hell, or Purgatory. "Vita beatæ Mariæ Virginis Matris Dei, Emblemata delineata:" a set of 27 plates in 12mo. "Gloriosissima Virginis Deiparæ Elogia," consisting of nine plates of devotional subjects, 8vo. "The New Testament," consisting of twelve plates, including the title. N.B. The most valued impressions of this set, are those which were printed before the inscription that Fagnani inserted underneath the engravings. "The Passion of Jesus Christ," consisting of seven finely executed plates in 4to. "The Paintings in the Church of St. Peter at Rome," consisting of twenty-nine or thirty plates, in 8vo of which the subjects are the Acts of the Apostles. These are the plates of which we have spoken in our biography of Callot, as engraved at Rome, with the graver alone, under the direction of Philip Thomassin. "Vita Historia Beatæ Mariæ Virginis, Parisiis," fourteen plates, including the title and tail piece. These may be distinguished from Callot's other plates, in honour of the blessed Virgin; by the inscription "Attributa beatæ Mariæ." "Male and Female Penitents," six plates, of which the subjects are 1. The Title by Ab. Bosse; 2. St. Jerome; 3. St. John; 4. St. Francis; 5. St. Mary Magdalen; 6. The Death of the Magdalen. "Salvatoris beatæ Mariæ Virginis sanctorum Apostolorum icones," a set of sixteen plates in 8vo. published at Paris in 1631. "Martyrium Apostolorum," a set of sixteen finely engraved plates, in 12mo. "The four little Banquets," a set of four small plates, of which the subjects are 1. The Marriage of Cana; 2. The Repast at the House of the Pharisee; 3. The Lord's Supper; 4. Our Saviour with the two Disciples. "The Life of the Prodigal Son," in 12mo. published by Israel in 1635. "Sulta d'alcuni miracoli, etc." after various masters, forty-one plates in 12mo. "Lux Claustrii," representing, under various emblems, the sweet serenity of a religious life, and consisting of twenty-seven plates with an historical title. "The seven Mortal Sins," on seven plates, 12mo.

Battles, Sieges, &c.—"A General on Horseback," an army in flight, surmounted by a hat and feathers, and the truncheon of command, small. "A Pistol shot," a grand review of cavalry. "Descent of the Troops into the Isle of Ré:" this engraving is of an oblong form, and is enclosed in an ornamented border. "The Siege of Ré," a set consisting of six large engravings in ornamented borders; the borders are engraved on separate plates, and four plates of writing accompany the set. These were engraved at Paris, under the patronage of the king of France. "The Siege of Rochelle," embellished in the same manner, and also done under the patronage of the French king. The portraits of the king, and of Gaston of France occur in the borders. "The Siege of Breda," a set consisting of six large engravings, and two double leaves of engraved writing, recording the events of the siege: these plates were engraved for the Infanta of Spain. "Battaglia de ri Tessi et del re Tinta," a large engraving, which is usually called "L'Evan-tail," or "The Fan," on account of its form. It is enclosed in a border, and represents a curious fireworks which was played off on the Arno. The words Tessi and Tinta allude to the weavers and dyers (tisserand and teinturier) who at that time enjoyed great privileges at Florence. "The Heroic Actions of the Medici," after Ant. Tempesta, engraved on fifteen folio plates, and without any etching. The impressions from these plates, which are found in the

"Galeria Medicia," are not esteemed the best. "The Great Miseries, or Horrors of War:" these admirable compositions are a set of eighteen 4to. plates, and were published by Israel in 1633. They were followed by "The Lesser Evils of War," on seven 8vo. plates, including the title, (which is by Ab. Bosse,) published in 1636. "Military Exercises," on fourteen small plates, published also by Israel. "Combat at the Barrier," a set consisting of eleven plates including the title. These prints are of different forms and sizes. They were originally published by Callot himself, at Nancy, in the year 1627, but have since undergone some alterations; the work is in 4to. "Naval Engagements:" these consist of the victories gained by the grand duke of Tuscany over the Turks, and are also in 4to. dated 1617. "Seven Tilting Pieces," in 4to. engraved at Florence, four only of these bear the name of Callot. "Jousts and Tournaments," a set of five spirited prints in Callot's best manner, in 4to. of which the subjects are, 1. A plan of the Jousts and Tournaments. 2. A Battle enclosed within oval lists, inscribed "Uno Degli abbattimenti;" 3. Several squadrons in battle array, enclosed in a similar manner, and inscribed "Mostra della Guerra, d'Amore;" 4. Parties of cavaliers racing in a circle; 5. Four triumphal cars characteristic of the quarters of the globe, drawn by appropriate animals, and inscribed "Carra del Asia," &c.; they were published at Florence, and are after the designs of Callot's first Roman master, Giulio Parigi. "La Guerra d'Amore," consisting of four 4to. plates, from the designs of the same master. They represent the ballets, &c. celebrated at Florence on the occasion of the arrival of the prince of Urbino, by the grand duke and Tuscan nobility on the plain of St. Croix.

Profane and Miscellaneous Subjects.—"The Giants," a large folio plate, in which Callot has introduced an assembly of the heathen deities, Temple of the Muses, &c. "The Giants struck by Jupiter's Thunderbolts," in folio, of the oval form, and now very scarce. "Pandora," a folio plate. The gods are here represented as assembled on Olympus, with Jove armed with thunder on its summit. "Catafalque de l'Empereur Mathias," a folio plate, dated 1619, and inscribed "Esseque celebrati in Fiorenza," &c. "A Gambling House," a folio plate, the subject a night-piece, with gamblers; Callot afterwards repeated this engraving, reversing the right hand to the left. "The Punishments," in 4to.; this is regarded as one of the chef d'œuvres of the master, not only on account of its intrinsic merits, but of the great number of figures contained in it, of the composition and grouping of which we have already spoken. Its subject is the execution of various criminals. In the most perfect impressions of this plate, a small square tower appears above the houses, a little to the left of the middle of the print, and a very small image of the blessed Virgin, is placed at the angle of a wall which forms the corner of a street, and is also near the middle of the engraving.

The following are generally known among collectors by the name of the three ovals; "The Adoration of the He-goat or the Sabbath;" "An Altar, with two small Figures at Prayers;" "A veiled Female, standing before the Throne of an Emperor." "Esseque della Regina d'Espagna," consisting of twenty-six plates in 8vo., after Ant. Tempesta. Of these Callot himself engraved only eight, the remainder are by Tempesta himself, or by anonymous artists; "The Whims or Fantasies" of the noble Jacques Callot, fourteen small plates of whimsical subjects, published by Israel in 1635; "Capriccie de varii figure di Jacobo Callot in aquaforti," on sixteen small plates engraved at Florence; "The Capriccs," which are copies of the above, engraved at Nancy.

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Nancy. Beneath the title of the latter is inscribed "excud. Nancy," but the Florentine set is executed with superior taste and feeling; "Varie figure di Jacobo Callot," on seventeen small plates, including an historical title; "Balli di Stefania," on twenty-four small plates, including an historical title: each plate contains three figures; "Varie figure Gobbi di Jacobo Callot, fatte in Fiorenze," a set of sixteen small plates, generally called, in England, the Hunchbacks, or Pigmies. This is a droll set, and as the author may be said to have here presented us with a back view of nature, the title page is a figure who shews his posteriors. Callot repeated this set with some variations. "Les Guerra di Callot," twenty-five plates in 8vo., which are much sought after by connoisseurs. On a piece of drapery in the title page, is inscribed "Capitano di Baroni;" "March of the Bohemians," on four 4to. plates in form of friezes. These are probably done from his lively recollections of the gang with whom he first travelled from Lorraine to Florence; "Nobility, or the Fashions of the Times," twelve plates in 8vo., on which are portrayed six of either sex with very amusing backgrounds.

There are four other similar prints, but of a larger size, by Callot, which are very finely executed, and which consist of the costume of the inferior orders: 1. A Woman in a Corset trimmed with Fur. 2. A Villager spinning. 3. A Countrywoman walking with a Basket on her Arm. 4. A Woman with her Face seen and Petticoat turned up. "Tragedia del Co. Bonarelli," on sixteen quarto plates, with a portrait; "The three Interludes of Florence," in 4to. after Giulio Parigi. These represent a festival given at Florence during the carnival, and are rare, particularly the two latter; the plates for "A Voyage to the Holy Land," consisting of forty-eight in 8vo. which Callot engraved for a Grey friar, with whom he had formed a friendship, and who published this voyage; "The Twelve Months of the Year:" these twelve prints are rare; they are after Jodocus de Momper, in 4to., and solely the work of the graver; "The Four Seasons," in 4to. extremely scarce. These prints are copied from four engravings that the Sadeliers engraved after Baffan; "The current Coin of Germany, Italy, &c." ten sheets, engraved at Nancy for Gaston of France, and published at Paris by Israel Silvestre in 1662; "A Woman sitting in a Field," a child in her arms, and another eating fruit, is seated under a tree, a small engraving, and very rare; two small prints, called by the French collectors "Deux Filenses assises," and "Deux Dames qui se promènent," are also rare; "Two Females habited à l'Allemande;" "A female Gardener with an As;" and "An old Man, accompanied by a little Boy," are small plates, with landscape backgrounds.

The following farcical subjects are executed on small plates, in the same style as the celebrated "Beggars" by this artist, and with equal spirit, viz. "A comic Figure," (a sort of Falstaff, with a large belly and wearing a sword); "Two Harlequins," who are dancing in grotesque attitudes; and "A Buffoon," "A Scaramouch," and "A Pierrot," three plates with theatrical backgrounds; "A Comb Merchant," another comic figure, bearing a pedlar's pack on his back, and holding a comb in his hand.

Topographical and other Landscapes.—"View of the Louvre, with the ancient Tower of Nefle," a folio plate; "View of the Pont-Neuf at Paris," ditto. These are of the best of Callot's landscapes. Another view of the Pont-Neuf was engraved by our artist in 1629, in which the ground was etched by Silvestre. This is a 4to. plate, and the impressions which are (on account of their rarity) most in esteem, are those which were taken before Silvestre touched the plate; "The

Parterre of Nancy," where many persons are walking, a piece in the long and narrow form of a frieze; "The Garden of Nancy," an extremely rare print, inscribed Jac. Callot, inv. et fec.; "La Carriere," the new street of Nancy, in which is introduced a carousal and tilting-match. This is also in the form of a frieze, and the earlier impressions are without the name of Silvestre; "La petite Place de Sienne," in 4to.; "The Great Fair of Madonna del Imprunetta," called in England "The Great Fair of Florence," on account of its having been engraven in that city. It represents a fair which is annually held in honour of the miraculous conception; and is esteemed one of the most capital, as it is one of the largest of the engravings of Callot, being in length twenty-six inches and sixteen in height. It consists of a bird's-eye view over a vast area, which is terminated by the church of the holy Virgin, and more remotely by distant mountains. Within the area thousands of figures, grouped with appropriate taste and skill, are engaged in all the varieties of business and entertainment which is presented by an Italian fair held under a genial sky. It perfectly suggests Milton's idea of

"The busy hum of men,"

and is in truth a surprising production, such as modern art, and modern attention almost would turn from in despair: yet so superior was the patient attention of the public of two centuries ago, and the patient skill of our artist, that Callot copied this print, on account of the great demand for it, and even, as some authors have asserted, engraved a third plate of the same subject, with some slight variations.

The first plate, which was published in the year 1620, is distinguished from the second, by the words "*in Fiorenza*," which appear below at the right hand corner of the margin of the plate, whereas in the second plate, the words in the same part of the margin are "*scilicet Florentie—et excudit Nancij*," which latter word has occasioned it to be contradistinguished among connoisseurs and dealers, by the title of "The great Fair of Nancy." The first plate may also be known to persons of taste and discernment, from the second, by its superior style of execution: there is a certain spontaneity, the result of original feeling, in the first, which could not be copied even by the author himself, without some symptoms of restraint. The scarcity of good impressions also makes it bear a much higher value than the copy: for as it was far less successfully corroded with the aquafortis, the number of good impressions which the plate produced was much more limited.

A third plate of this subject is mentioned by Rost and Huber, but the present writer has not seen it, nor does it appear to have been seen,—at least it is not mentioned—by Strutt. Perhaps the copy by Savery may have led these authors into error on this point. The copy may easily be known from those by the hand of Callot, by its inferior merits, and by its being reversed. "La petite Foire," (the little fair) otherwise called "The Players at Bowls," is not properly the representation of a fair, but of a village fete. Peasants are dancing in a ring, and the musicians are seated in a very large old tree, which has all the appearance of being a portrait. The players at bowls, are a group at the right hand corner of the print. Strutt says, that "this is one of the scarcest of Callot's works, and it is very difficult to meet with a fine impression of it, for the distance and other parts of the plate failed in the biting." It is an oblong folio, and the proof impressions, which, of course, are most sought after, are before the name of Callot was engraven. A landscape, in the front of which are two pilgrims. It is in 4to. and without the name of Callot. "A Stag Hunt:"

in the ordinary impressions of this plate, the small and distant wild boar hunt is scarcely seen. It is a folio, and of the frieze proportions. "A double Rock in the Middle of the Sea;" on the top of this double rock are two eagles with a bannerol, and an inscription in honour of Columbus, in 4to.; "The two jolly Mariners," a well executed plate, in 4to.; four landscapes, lengthways, in small 4to.; "The Grand Thesé," two emblematic plates in folio, dedicated to the duke of Lorraine; "A Vine Arbour," a small 4to. plate, the subject of which is a fête before the door of a country public house, with an inscription on the margin, signifying that this is the *last* plate engraven by the late Jacques Callot, to which the aquafortis was not applied till after his decease; from which it may be presumed that the death of our artist was somewhat sudden.

The following *Portraits* are also from the graver or etching needle of this distinguished engraver. Cosmo III. grand duke of Tuscany, in an ornamented oval. François, grand duke of Tuscany, ditto, in 4to., very rare. Charles III. duke of Lorraine, in 4to. rare. Louis de Lorraine, prince of Phalsbourg, on horseback, 4to. Le Marquis de Marignan, a general in the service of the emperor Charles V. 4to. Donatus Antellensis, senator, commonly known by the name of "The Senator," in an oval, 4to. rare. Charles de Lorme, first physician to Louis XIII., in an ornamented oval, 4to. Giovanni Domenico Peri d'Archidossa, in an ornamented border, commonly known by the name of "The Gardener," in 4to.

The reader may perhaps be pleased to be informed that a small portrait of Callot himself has been drawn and engraved by Michael Lafne. It has the following inscription, "Jacobus Callottus Nobilis Lotharingus Calcographus."

The engravings of Della Bella are little less numerous than those of Callot; though the largest of Callot's exceed the dimensions of any of those of his successor. Their merits were in many respects very similar. If with the elegant lightness of form and exquisite taste of Della Bella, we seem more in the fairy land of engraving, Callot possessed more perspicuity, more firmness of outline, and greater powers of composition; yet they are twin brothers in point of excellence, and, to the present hour, unrivalled in their department of art, though it must be allowed that Mons. Berthaud, the Parisian, has of late years made some very near approximations toward the merits of Callot and Della Bella. We are enabled to add the following list of select prints by the latter, to the scanty list of Strutt, which the reader will find affixed to our biography of Della Bella:—A portrait of Della Bella, dressed in the Persian habit, drawn and engraved by himself. Other portraits of Sigismund Boldrini, a noble Milanese. Mount-Joy St. Denis, king at arms, with a grand funeral procession in the back ground; a very rare print, in 8vo. Horace Gonzales, in an oval; likewise very rare. Ferdinand II. emperor of the Romans, in folio. Bernardo Ricci on horseback, surnamed II Tedeschino; Ferdinand II.'s jester, in folio. St. Antonin, archbishop of Florence, kneeling on the clouds, Della Bella's earliest engraving.

Historical Subjects, &c.—"St. Anthony, mounted on a Monster with two Heads, a Man's and a Woman's," inscribed "Super aspidem et basilicum ambulatis;" a small upright plate of "The Departure of Jacob with Rachael and her Flock;" "Jacob's Journey to Egypt in quest of Joseph," in 4to.; "The Battle of the Amalekites," of the same size; a small upright plate of "St. John, leaning his right Hand on a Lamb;" a small upright print of "The Virgin sitting with the Infant Jesus;" another "Virgin and Child;" another of "The Virgin suckling

the Infant," on a white ground; "A Repose," in a circle; another "Repose," where, in the background, St. Joseph is leaning against a tree, reading, in 4to.; "A Flight into Egypt," surmounted by cherubs heads; another small upright print of the same subject, representing "The Holy Virgin, with the Infant in her Arms, sitting on an Ass, led by St. Joseph;" another "Holy Virgin suckling the Infant Christ," inscribed Caracci inv. in a circle; "The youthful Saviour explaining the Sacred Writings to his Mother and St. Joseph;" in the clouds is God and the Holy Spirit, a very rare little print, first etched, and afterwards finished with the graver; a very rare print, entitled "Effigie del glorioso Martire Sto. Benedetto;" the discovery of the miraculous image of "Notre-Dame del Imbrunetta," near Florence; "The Church Triumphant," an allegorical figure, clothed in a priest's garment of white linen, and crowned with a tiara, with one foot on the earth and the other on the sea; a small folio print of "St. Prosper descending from Heaven;" a nearly square print of the tyrant Phalaris, enclosing Perillus in the brazen bull, from Polidoro; an antique bas-relief of a female with her face covered, from the same master; a small standing figure of Lucretia, from Parmegiano; a small plate, nearly square, of three children holding above their heads a wooden dish, on which are three verses, from Guido; an antique bas-relief of a female, standing, trying to stop a ball; a folio print in a square ornamented border, of a soldier on horseback, galloping away with a female, called "Clovis and Clotilda," very rare; a sailor, of whom a beggar is asking charity; a young sailor, sitting on a hillock half covered with his cloak, laying his hand on a dog's head, with other figures; a small print of four Turks, half length; another of three, with a negro and a boy; the huntress holding a dog, a singular engraving, marked twice with S. D. Bella; an eagle, with extended wings, devouring a hen; above, in a circle, are two horses escaping, and a multitude of spectators, in small folio; "The Philosopher's Stone," in large 4to. a very fine and large print; "The Fan," or a fête on the Arno, an oval print, which was long attributed to Callot; a perspective view of the catafalque of the emperor Ferdinand, and of the interior decoration of the church, with the arms of the family of Medicis, in folio; a grand Thesé supported at the canonization of Francis Solanus Condelier, at Rome, a rare print, in large folio; a plan of the siege of Rochelle, signed Stefano Della Bella del. et fecit; a large upright print of the plan of the siege of Arras, done for cardinal Richelieu, signed as before; the Repose, or feast of God, a large print, lengthways, of which it is very difficult to find a good impression; a view of the Pont-Neuf at Paris, a large print lengthways: the first impressions of this plate were taken before the weathercock was added to the steeple of St. Germain l'Auxerrois; a folio print of the Castle of St. Angelo; on the foreground are groups of figures.

The following are in Sets.—Two landscapes; two other landscapes in the taste of Silvestre; six different views of the Pont of Livourne, in large folio; the four seasons, represented in ovals; the four elements; eight marine subjects, in the style of Callot, entitled "Divers Embarquements, faits par S. D. Bella," dedicated to Lorenzo de Medicis; six prints of vases, in 4to. in a rich and exquisite taste, and very finely executed; six landscapes, in circles; four very fine landscapes, with figures, in folio; four views in Rome, namely, the temple of Antoninus Pius, the arch of Constantine, the temple of Concord, and the celebrated vase in the gardens of the Medicean palace, in which Della Bella has introduced his own portrait; three grand

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grand subjects of battles, 1. A naval combat before the isle of Ré; 2. The descent of the English in the isle of Ré; 3. The defeat and capture of general Lambay, with a plan of the battle: these three plates were drawn and engraved by Della Bella, for the book of Valdor, entitled "*Triomphes de Louis le Juste*;" twelve prints of Moors, Hungarians, Asiatics, and Africans, on horseback, in circles, with very fine backgrounds, in 4to.; a set of sixteen small square subjects, representing warriors, hunters, fishers, and peasants, &c. very rare, and attributed by some to Callot; another set of eighteen, intitled "*Raccolta di rari capricci, nuove invenzioni di Cartelli et Ornamenti, possi in luce dal Sign. Stefano Della Bella*," of different sizes; another set of twenty-eight, intitled "*Vues d'édifices et d'endroits publics, mise au jour par Israel Silvestre*," in folio; more than half of these views in France and Italy are engraved by Della Bella; a set of twenty-two, intitled "*Divers griffonemens et épreuves à l'eau forte, faites par Stef. Della Bella*," of different sizes: this set has often been reprinted and enlarged, and the good impressions are now become very scarce; a set of five of Death preying upon the human species of all ages, with fine backgrounds; and one entitled "*La sixième mort*," a melancholy subject, began by Della Bella, under his unfortunate malady, and finished by his pupil Galisfrucci.

Antonio Francesco Lucini was also of Florence, and born in the same year with his countryman Della Bella, from the study of whose works, and those of Callot, he appears to have formed his style. His plates are marked with one or other of the monograms which will be found in our *Plate III.*

His principal works are a set of sixteen very rare prints of the battles and assaults of the Turks during the siege of Malta, from the pictures by Mattia Perez de Alesio, and a set on the Arno, of folio dimensions, after Della Bella, dated 1634.

Francesco Cozza has been already noticed as an historical painter in fresco. (See COZZA.) His prints consist of spirited etchings, in which the manual part is executed with more neatness than has often been attained by painters. In "*St. Peter's Contrition*," he has shewn much good drawing, though the print is slight. The other works we shall mention from his hand are, "*A penitent Magdalen*," and "*A Roman Charity*;" they are all from his own compositions, and of folio dimensions.

Cæsar Bassano, or Bassanus, was born at Milan in the year 1584. Under whom he studied has not been ascertained. He worked entirely with the graver, and his style bears considerable resemblance to that of Cornelius Cort.

The most considerable work in which he was engaged, and which he executed in conjunction with Falcini and Ciambelanus, is a set of sixteen plates, entitled "*Il Santo Senato de Giesà*," a very rare work, which both Heinnekin and Strutt have omitted to mention. It consists of heads of the Virgin Mary, Jesus Christ, and the Apostles, selected and engraved from pictures of the very first celebrity.

The other known engravings of Bassanus are, a portrait of Gaspar Afellias; an architectural Frontispiece for a work by Francis Piccolini, in folio; and "*The Nativity*," of the same dimensions.

His coadjutor Ciambelanus, or Ciambelanus, was originally a doctor of laws, but quitted the study of jurisprudence for that of engraving. The cypher which he affixed to his prints will be found in *Plate III.* of the monograms of the *Italian School of Engravers*; and we have already men-

tioned the leading events of his life under the article CIAMBERLANO.

The principal engravings by this artist are "*A dead St. Jerome, lying on a Stone*," after Raphael; a set of ten plates, after different masters, in 8vo, consisting of devotional subjects; "*Angels holding the Instruments of the Crucifixion, Passion, &c.*;" another set of fourteen, in small folio, after Raphael, of "*Jesus Christ and the Apostles*;" "*Jesus Christ on the Mount of Olives, comforted by an Angel*," from Al. Cafolani, in folio; "*Jesus Christ appearing to Mary Magdalen in the Garden*," from Barroccio, in large folio; "*Christ appearing to St. Theresa with his Cross*," 1615, in folio; two subjects of Thebes, dated 1628, in large folio.

Giovanni Francesco Barbieri.—Guercino da Cento is the name by which this justly celebrated painter is most commonly known; for an account of whose great merits as a painter, see the article BARBIERI GIOVANNI FRANCISCO. As an engraver, he has left but few memorials behind him; but those are executed with great freedom and spirit, in a manner much resembling those admirable drawings of his with a pen, which are held in such high estimation: "*St. Anthony of Padua*;" "*St. Peter in Grief*," both half lengths, inscribed "*Joan F. Barbieri f. Id.*" in folio; "*St. John*," the same; "*St. Jerome before the Crucifix*;" a portrait of a man with a hat on, and a curled beard; portrait of a female with curled hair; and a bust of a man in an eastern costume, all of folio dimensions; are probably all the prints that Guercino ever produced.

Luciano Borzoni was born at Genoa in the year 1590, and died in the same city in 1645. He learned the elements of art of his uncle Philippe Bertolotto, and Cæsar Corte. His pictures possess much merit, are well coloured, and carefully executed. He painted with the same success in oil as in fresco; and whilst painting the ceiling of the church della Nanzziata, he unfortunately lost his life by a fall from the scaffold.

He left three sons, all artists, among whom Francesco Marie distinguished himself most, by painting landscapes and marine subjects.

Borzoni etched many of his own compositions with a considerable portion of taste, among which the following will probably be found to possess most merit: a portrait of Guisliniani; "*St. Peter delivered from Prison*;" "*The Vulture preying on Prometheus*;" all of which are in 4to. Some Holy Families, Madonnas, and other devotional subjects, constitute the remainder of his works on copper.

Vespasiano Strada was the son of a Spanish painter of some eminence, but was born at Rome in the year 1591, during the residence of his parents in that city, where he died at the age of thirty-six.

His works consist of etchings from his own compositions, executed in a painter-like style; slight and rapid, but masterly and free. Those held in most estimation are "*Pontius Pilate producing Christ to the People*," half figures, in small folio; the same subject, of the upright form; "*St. Catherine adoring the Infant Christ*," in 4to.; "*Christ crowned with Thorns*," in small 4to.; "*The Holy Family, with St. John*," ditto; "*The Holy Virgin supported by Angels*." His plates are generally marked with the initial letters of his names.

Of Alessandro Algardi, a Bolognese artist, who lived at this period, we have already treated. (See ALGARDI.) To the engravings we have mentioned by him, the collector should add "*The Cries of Bologna*," consisting of eighty 4to. prints after Caraeci, engraved by Algardi in conjunction with Simon Guillain.

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The etchings of Spagnoletto (for an account of whose extraordinary talents as a painter, see the article *RIBERA*) are executed in a bold, firm, and free style: his chiaroscuro is broad, powerful, and pleasing; and he drew with admirable skill. His heads, hands, and feet, are marked in a masterly manner; and among the former, those of his old men, which he was fond of introducing into his compositions, are deservedly admired.

In *Plate III.* of the monograms of the *Italian Engravers*, will be found the various cyphers with which he occasionally marked his performances, of which the following are justly held in esteem: "A dead Christ;" "The Martyrdom of St. Bartholomew," both of folio dimensions; in small folio, "A penitent St. Jerome, with an Angel blowing a Trumpet." (Note.—There are two plates of this subject, in one of which the angel is omitted.) Another St. Jerome, a small upright, where a skull lies on the ground, and the faint is reading; a folio plate of "Bacchus made drunk by Satyrs," dated 1628; two small heads of old men, one of them with the face covered; "Dante crowned with Laurel, sitting in a Desert;" "Don Juan of Austria on Horseback," a folio plate.

The above are all from his own compositions; and we know of but one work of Spagnoletto that is after another painter, namely, "A Repose, during the Flight into Egypt," from Charles Saracenus, wherein angels are soothing the holy travellers with divine music.

Oliviero Gatti was of the Bolognese school, and apparently studied engraving under Agostino Caracci. He was born at Parma in the year 1598; but the time or manner of his death have not been recorded.

Gatti worked chiefly, if not entirely, with the graver; and his prints have a considerable share of merit. He attended but little to the textures of various substances, and hence his execution is somewhat dry; but he possessed that first requisite of a good engraver,—found drawing.

His best prints are "St. Francis Xavier kneeling on the Sea-shore to take up a floating Crucifix," from his own composition, and of folio dimensions; a half figure of "The Holy Virgin caressing the Infant Christ," in 4to., after Garbieri; "St. Jerome embracing a Crucifix," a folio plate, after Agostino Caracci, dated 1602; an emblematic or heraldic subject from Lodovico Caracci, representing an armed knight, surrounded by Jupiter, Hercules, Neptune, Apollo, and Pallas, and an armorial bearing supported by two river gods, of a folio size; and a set of four ovals, in 4to., after Pordenone, of which the subjects are "The Deity forming the World," "The Creation of Adam," "Abraham's Sacrifice," and "Judith with the Head of Holofernes."

Giovanni Battista Vanni was celebrated to a certain degree in the three arts of architecture, painting, and engraving. He was born at Pisa in the year 1599, and died at Florence in 1660. He frequented different schools, and is believed to have learned etching of Julio Parigi.

His etchings are performed in a painter-like manner, with freedom and spirit, but are deficient in correctness; and are marked either with the initial letters, or some contraction of his names. Of these the most distinguished are "The Dome of the Cathedral at Parma," after Correggio, engraved on fifteen plates, and dated 1642; "The Martyrdom of two Saints," also from a picture by Correggio; and "The Marriage of Cana in Galilee," a large folio print, engraved on two plates, after Paul Veronese, dated 1637, and justly reckoned the master-piece of Vanni.

Giovanni Battista Mercati also produced some spirited etchings about this period. He was a native of Sienna,

born about the beginning of the seventeenth century, but resided for the greater part of his life at Rome. His prints are slight, yet manifest some taste; and he etched both history and landscape.

The following will probably afford the collector the most satisfactory specimens of his powers: a set of fifty small plates of the ruined edifices of Italy, in a style which might be suspected to be borrowed from that of Silvestre, if Silvestre had then appeared; a set of four of the bas-reliefs which adorn the arch of Constantine, of the folio size, and circular form; "St. Bibian refusing to sacrifice to Jupiter," after Pietro da Cortona, in folio, dated 1626; and "A Holy Family, with St. Catherine," a small folio, after Correggio, dated 1620.

Giuseppe, or Joseph Cremonese, was born at Cremona in the year 1600, and resided at Ferrara. There is a picture of his, of St. Mark, preserved at the church of St. Benet, at Ferrara, which is mentioned with great praise in the Italian tour of Cochin. The following prints of mediocre pretensions are engraved by this artist from his own designs:—"Samson and Dalilah;" "David, with the Head of Goliath;" a kneeling figure of "St. Roch," all of folio dimensions;" "David contemplating the Head of Goliath;" a bishop of the order of St. Bernard; and, a study of a naked female; all of quarto size.

Pietro, and Jacques-Antonio Steffanoni, father and son, were born at Venice, the father in the year 1600, and the son in 1620. They went to Rome, where they engraved in conjunction with each other. There is a book, etched by Pietro, of instructions in drawing, consisting of forty plates; and some prints for a work of antique gems, by Fortunius Licetus. This book was first printed at Rome A.D. 1627, and reprinted by J. A. Steffanoni at Padua in 1664. We have, among others, the following etchings by the son, which possess some merit:—"The Virgin and Child, with St. John and several Angels," known by the name of "The Virgin of the Swallow," from L. Caracci; another "Virgin and Child, with St. John," half figures, from Aug. Caracci, both in quarto; a middling-sized upright print, of "A Merchant and his Family reduced to Beggary;" two more subjects of Holy Families, from Aug. Caracci; "The Slaughter of the Innocents," from Guido; "The Miracle of St. Antony of Padua," from Lorenzo Passinelli, in large folio; and "The Martyrdom of St. Ursula, and her Companions," of the same size.

Jean Baptista Pascalin, or Pasqualino, was born at Cento, a village near Bologna, A.D. 1600, and frequented the school of Cyrus Ferri; though he does not appear to have made any meritorious progress in painting. He engraved a great number of prints from various Bolognese painters, but particularly from his countryman Guerchino; whose bold spirited style in drawing with a pen he attempted to imitate with the graver, but he did not possess sufficient command of that instrument to succeed, neither is it at all adapted to such a purpose. The etchings of Pascalin, according to Huber, always convey the idea of original compositions, but in this praise we cannot conscientiously join. Those among them which are entitled to most commendation, are "St. Felix, a Capuchin, kneeling before the Virgin and Infant Christ," in folio; "St. Diego," from L. Caracci, marked J. B. Centensis; a large folio print of "The Death of St. Cecilia," from Dominichino; "The Aurora," a large print lengthways, on two plates, from the celebrated picture of Guido, which has since been finely engraved by Giacomo Frey, and also by Audenarde.

The following Subjects are from Guerchino:—A small print of "Jesus Christ dictating to St. John;" a large upright print

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print of "The Resurrection of Lazarus;" "Christ giving the Keys to Peter," a middling-sized upright; "Christ taken into Custody in the Garden of Olives," in folio; "The Apparition of the Angels, who shew to Mary Magdalen the Instruments of the Passion," in large folio; "The Pilgrims on their way to Emaus," in quarto; "The Incredulity of St. Thomas," in folio; a small folio print of "Orpheus playing on the Violin;" two Holy Families, both in quarto; "St. Charles Borromeus;" a middling-sized upright, entitled "St. Felice Cappucino miracolosamente resuscita un fanciullo morto;" and "Tancred and Erminea," dated 1620.

Of ANDREA CAMASSEI; the two CURTI, FRANCESCO BERDINI; CAMILLE CONGIO, and GIULIO CARPIONE, who all lived at this period, we have already treated: as, see these articles respectively.

Giulio, or Julius Cæsar Veneti, was born at Bologna in the year 1609. He learned drawing under Philip Brizio, who was of the school of Guido, and one of the best of his disciples. Veneti was a gentleman of fortune, and not professionally an artist, yet the meritorious plates which he etched *con amore*, have been thought worthy of a place in the Italian school. His etchings are performed in a slight style, are marked with one of the two monograms which we have copied in Plate III., and their subjects are—"The Guardian Angel," in quarto; "Mithridates presented with a Cup of Poison;" "Tancred and Clorinda," all after D. M. Canuti; "The Virgin of the Rose," after Parmegiano, all in small folio; and "The Holy Family reposing," after Annibal Caracci, in larger folio.

For the biography of Francesco Grimaldi, surnamed BOLOGNESE, see that article. His etchings are performed with painter-like freedom and spirit, and in those of landscape in particular, he discovers a sounder knowledge of perspective, than perhaps had yet appeared in Europe, and his trees are ably characterized.

Of his numerous plates, which are almost entirely from his own compositions, we shall mention as worthy of preference—a rich landscape, with buildings, and fishermen on the fore-ground; another, in which the baptism of our Saviour is introduced, both in folio; two ditto, in larger folio, of mountainous scenes, with figures and ruined buildings; two ditto, of the upright form, after Annibal Caracci, in one of which is a river winding through forest scenery; four ditto, from the same master. His view of Castel Gandolfo is a well-known and justly admired production, which will long continue to be a favourite study with landscape painters, and of which there has been a finely engraved copy produced in our own country by Vivares and Chatelain.

Agostini Metelli (the elder), was a native of Bologna, born A.D. 1609. He studied successively under Gabriel Ferrantini and Dentone, and, besides his merit as an engraver, excelled in painting architectural ornaments both in fresco and in oil. He was invited to Spain by Philip IV., and died at Madrid in the year 1660.

His etchings are performed with no inconsiderable portion of taste, and we believe are entirely of an ornamental character. His set of forty-eight friezes are after his own designs. Twenty-four plates of ornaments, are partly taken from the designs of F. Curti, and are partly engraved by the younger Metelli, of whom we are about to treat.

Gioseffo Marie Metelli was the son and scholar of Agostino, and was born at Bologna in the year 1634. After acquiring the rudiments of art from the instructions of his father, he successively frequented, for his improvement, the schools of Albano, Guercino, Del Torre, and Cantarini.

The plates of Gioseffo consist chiefly of etching, which

he executed in a slight manner. His *chiaroscuro* is feeble, his drawing incorrect, from haste or negligence, and he gave no attention whatever to the art of expressing the textures of various substances; yet what he did, could only have been done by the practised hand of an artist, and this circumstance combined with the intrinsic merits of many of the pictures after which he engraved, have made his prints (which are somewhat numerous) fought after by the cognoscenti.

The various monograms with which he occasionally marked them, will be found in Plate III. of those used by the *Italian Masters*, and among his best works may be ranked the following:—A set of twelve large upright folio prints, from the most esteemed pictures in the churches of Bologna; a set of twenty, from the history of Eneas, painted by the three Caracci, in the Favian palace at Bologna, in large folio; a set of forty, in small folio, and of the upright form, of "The Crises of Bologna," from Annibal Caracci; "The Adoration of the Shepherds," a large upright folio, from Correggio; "The Martyrdom of St. Erasmus," from Poussin; "David and Goliath," from Titian; "The Invention of the Cross," from Tintoret, all in large folio; "Lazarus at the Gate of Dives," after Paul Veronese.

He also produced several plates from his own compositions, particularly "The four-and-twenty Hours of human Felicity," which were published at Bologna in 1675, and to which he afterwards added two plates, so that the complete set consists of twenty-six; and a set, of which we know not the precise number, called "Metelli's Collection of Proverbs," published in the year 1678, both of which series are now become exceedingly rare.

Pietro del Po was born at Palermo A.D. 1610, and died at Naples in 1692. He travelled to Rome, and was much employed there in the adornment of churches, both as painter and architect, and also by the Spanish ambassador.

Del Po engraved a considerable number of plates which consist of etching mingled with the work of the graver. The general style of his art appears to be studied from that of Dominichino; and the most distinguished of his prints are "St. John Baptist in the Wilderness;" "The Woman of Canaan;" and "A dead Christ on the Lap of the Holy Virgin," all in folio, and after Annibal Caracci; "The Madonna and Child attending to the divine Harmony of Angels;" "St. Jerome on his Knees, consoled by an Angel;" and a set of the cardinal virtues, "Prudence," "Justice," "Temperance," and "Fortitude," all in large folio, after Dominichino; "The Annunciation;" "The Nativity;" and "The Flight into Egypt," in folio, after Poussin; "Achilles and Ulysses," after the same master; "Venus and Cupid visiting the Forge of Vulcan," after Sitto Badalocchio; and "Neptune in his Chariot," after Julio Romano, of the octagon form; all of folio dimensions.

Giacomo del Po, and his sister Theresa, the son and daughter of Pietro, also etched several plates, in a style resembling that of their father, among which is "Susanna surprised by the Elders," after Caracci, a folio plate, engraved by Theresa.

Simon Cantarini, surnamed Il Pefarese, was born at Pesaro, a city of Urbino, in the year 1610. He learned the rudiments of art under Ridolfi, but afterwards became one of the most distinguished of the pupils of Guido, whose style, both of painting and etching, he imitated with so much success, that the works of the disciple are not unfrequently mistaken for those of the master.

Cantarini died at Verona, at the early age of thirty-eight. He produced a great number of prints, which are for the most part of religious subjects, and of which Adam Bartsch has formed a catalogue which we believe is complete.

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Among these are seven of what the Italians term *Reposos*, during the flight into Egypt, three, of which the Holy Family is the subject, and four, of the Madonna and Child; they are after his own compositions, and of 4to. dimensions.

The remainder that are worthy of selection from the works of Cantarini are, "The Beatification of the Holy Virgin;" two plates of "St. John Baptist in the Wilderness;" "The Martyrdom of St. Sebastian;" "St. Anthony of Padua on his Knees adoring the Infant Saviour surrounded with a Glory of Angels," in folio; a small print of "St. Anthony of Padua kneeling before an Altar, holding the Infant Christ in his Arms;" "St. Benoit curing the Demoniac," from Louis Caracci, in folio; "A Guardian Angel conducting an Infant to Heaven;" "Jupiter, Neptune, and Pluto, doing Homage to Cardinal Borghese," who is represented in heaven surrounded by geni, who display the attributes of the four cardinal virtues, in large folio; this print has been mistakenly called the *Quos ego*, and it is one of the finest engravings by Pefarese, though long attributed to Guido; "The Rape of Europa," in folio, a very fine print, and very rare; "Mercury and Argus," "Mars, Venus, and Cupid, at the Foot of a Tree," from P. Veronese, both in folio; "Venus and Adonis, with Cupid," in 4to.; "Love and Fortune," in 4to. (connoisseurs attribute this print to Pefarese, though it is marked "G. Renu in. & fec.") and a frontispiece to a book, representing a coat of arms, supported by two angels, blowing trumpets; at the bottom is a river god leaning on an urn; a very spirited etching.

Giovanni Andrea Sirani was born at Bologna in 1610, and died in the same city A.D. 1660. He was successively the disciple of Cavedone and Guido, and imitated the style of the latter, both in painting and engraving, with success. We have some masterly etchings from his hand, which may be regarded as original works, since they are from compositions by himself; these he commonly marked with his initials, G. A. S. or I. A. S. The following are generally, and we think justly, esteemed among his best productions:—"Judith, with the Head of Holofernes," half length, in the background is an old woman, in folio; "The Virgin and Infant Christ sitting on a Cushion, with St. John at her side," in an oval (this is from Guido); a small print of "St. Michael overpowering Satan," a middling-sized upright print of "A Sybil sitting on a Bank, listening attentively to an Angel, who is placed behind a Pedestal," from Guido; "The Rape of Europa," (this print is attributed to Sirani, but it is not in his style); "Apollo slaying the Satyr Marfyas," a small upright plate in an oval; "Saturn sitting on the Clouds," in 4to.; "Cupid standing on a Dolphin, shooting an Arrow into the Sea;" a bacchanalian subject of four children, one of whom holds a flask and goblet.

Elizabeth, was the most distinguished of the three daughters of G. A. Sirani, who were all artists; and was born at Bologna in the year 1638; she learned the rudiments of design and painting of her father, and her historical pictures are mentioned with the greatest commendation. She died at the early age of twenty-six, as it is said, by poison, administered by some that were envious of her great reputation. There are many etchings by her hand, executed in a slight, spirited style, but the extremities are finely marked; among which the following are the most esteemed: a middling-sized upright plate of "The Virgin of Grief," surrounded with the Instruments of the Passion, and accompanied by Angels; "The Virgin with the Infant Jesus, whom she holds on a Cushion, with St. John,"

in a circle: this very rare and excellent print was engraved by Elizabeth, at the age of nineteen, from a picture of her own, and is reckoned her best production; a small half length of "The Virgin, with her Hands crossed on her Breast;" "St. Eustace," magnificently habited, in the act of prostrating himself, striking his breast with his hand, in folio; "The Decollation of St. John," on the foreground is a profile of Herodias, accompanied by two of her women: this print has been retouched in many parts with the graver, and is not executed in the style of Sirani: yet her name is affixed to it, and its authenticity may therefore be regarded as doubtful; "Lucretia stabbing herself," dedicated to the prelate Paleotti.

Lorenzo Loli was born at Bologna in the year 1612. He was a favourite disciple of Guido, who was accustomed pleasantly to call him his gentleman of the bed-chamber; yet the improvement of a student is not always in proportion to the favour of his master, and Loli never attained any great degree of excellence as a painter; but there are many etchings by him executed in a free spirited style, from Guido, Sirani, and his own designs, of which the following are held in most esteem:—"A Flight into Egypt," in folio; "A Holy Family, with St. John and Elizabeth;" another "Holy Family, with St. Joseph leaning on a Pedestal in the Background," a small upright; two plates of "The Madonna and Child," one a small upright oval; "The Assumption," where the holy Virgin is represented as standing on a crescent, and angels worshipping (this is a rare print, and one of the very best productions of Loli); "St. Jerome in his Cavern;" "Mary Magdalen meditating on a Crucifix and Skull," both in 4to.; the latter is perhaps the only plate upon which this artist has worked with the graver; "The Holy Virgin in a Radiance of Glory," in folio; "The Recompence of Study," a small plate, wherein Genius and the Sciences are represented as leaning on the horn of Plenty; "Hercules combating the Nemean Lion," and "Perseus and Andromeda," both of the folio size; "The Infant Hercules strangling the Serpents;" "A sleeping Cupid;" "Cupid breaking his Bow;" three small plates of infant bacchanalians.

Contemporary with this artist was Gaspar Dughet (surnamed Poussin from his very distinguished brother-in-law Nicholas). For the biography and general merits of these great artists, see the articles *DUGHET* and *POUSSIN*. Gaspar etched a few plates with spirit, (though not equal to that of his pencil,) among which are a set of four landscapes in circles, of a small folio size; and another set of four, somewhat larger.

Jean Dughet, the brother of Gaspar, received instructions both from him and Nicholas Poussin, yet never attained to eminence either in painting or engraving.

The following prints from his hand are admitted into the portfolios of the curious, much more on account of the original pictures by Poussin, whence they are taken, than from their intrinsic merits as etchings; namely, "The seven Sacraments," from the set of pictures painted for the Commandeur del Pozzo, which differ in many respects from those which were in the royal collection of France, and are now in the marquis of Stafford's gallery; these are in folio, so large that each subject is engraved on two plates. "The Judgment of Solomon;" "The Birth of Bacchus;" and "Mount Parnassus," are also in large folio.

Pietro Testa, sometimes called among the Italians *Lucchesini*, from the place of his birth, was born, of indigent parents, in the year 1611, and poverty appears to have attended him through life, notwithstanding his merits. From his youth he manifested a violent inclination to pursue the
fine

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fine arts, and it is said, travelled from Lucca to Rome in the habit of a pilgrim. Here, regardless of external appearances, and even of the ordinary means of subsistence, he employed his time in drawing with the utmost assiduity from the antique statues, reliefs, and ruins, and in studying from the celebrated pictures with which that great metropolis abounded.

Under such circumstances, and entirely unknown to the great, Testa was soon reduced to distress; according to one of his biographers, his situation was most miserable, having scarcely wherewithal to cover his nakedness, or satisfy the cravings of hunger, and in this situation he was found by Sandrart, sitting among ruins, abstracted from all around him, and copying an antique bas-relief.

Struck with such meritorious raggedness, and naturally benevolent, Sandrart took our young enthusiast home with him, provided him with food and raiment, employed him to make copies of the great works in the Justinian gallery, recommended him to other employ, introduced him to the schools of Dominichino and Pietro da Cortona, and would in other respects have rendered him a social being, as well as a great artist, but for Testa's natural aversion to company and conversation, which was so great, that even his patron could seldom obtain a word from him.

His propensities to art, solitude, and silence, which, with Sandrart's friendship, conducted him to the high degree of excellence which he attained, occasioned also his death. In reaching for his hat, which the wind had blown into the Tiber, as he sat drawing alone, upon the banks of that river, he unfortunately fell in, and was drowned in the thirty-ninth year of his age.

The following summary is partly copied from the just estimate which Strutt has formed of the merits of this artist. He drew with great taste, and marked the extremities of his figures in a very masterly manner. The character of his heads are finely expressed, and the female faces are often very beautiful. When the extravagance of his fancy did not hurry him beyond the bounds of nature, his outlines are correct and elegant. The draperies of his female figures especially, are ample, flowing, and easy, and the forms of the naked parts beneath are accurately and sufficiently indicated, without academical ostentation. Yet, though his composition is frequently grand, and many of his figures highly graceful, it must be owned that awkward and constrained attitudes are sometimes introduced.

His style of etching is masterly and free, bearing superior resemblance to that of Antonio Tempesta, and every where animated by the wild energy of his nature; but his light and shades are not collected into broad masses, and of course his chiaroscuro, like that of most of Italian engravers of the age of Testa, is deficient in force.

The monogram with which our artist usually marked his engravings, is copied in our third plate of those of the *Italian Masters*. His prints, in general, of which Mariette possessed ninety-two, are held in high request by artists and connoisseurs, and among them the following are distinguished. They are all of folio dimensions, and some of them very large.

"The Sacrifice of Abraham;" "Angels ministering to the Holy Family," an emblematical subject, in which the Infant Saviour is embracing a cross held by angels, very large; a large upright print of "Our Saviour crucified between the Two Thieves;" "The Martyrdom of St. Erasmus," inscribed "S. Erasme ora pro nobis;" "St. Jerome at Devotion;" "St. Roch and Two Bishops praying for a Cessation of the Plague;" "The Sacrifice of Camma," who having drunk of a poisoned cup at the celebration of her marriage with Sinorix, the assassin

of her first husband, presents him with the cup, a large print; "Thetis plunging Achilles into the Styx;" "Achilles dragging the Body of Hector round the Walls of Troy;" "The Death of Cato;" "The Sacrifice of Iphigenia," an allegorical print in honour of pope Innocent X. with his medallion on a monument; "Socrates, at a Table with his Friends;" "The Study of Painting," dedicated to cardinal Francotti; "The Lyceum of Painting," inscribed "Il Liceo della Pittura," (with a dedication); "The Passions explained;" "Merit recompensed, and Parnassus triumphant;" "The Triumph of Love;" and "The Triumph of Bacchus."

Jean Cesar Testa was born at Rome in the year 1636, and passed for the nephew of Pietro, whose style of engraving he imitated. The following five are all we know of his works. A small quarto portrait of his uncle, entitled "Petrus Testa Lucensis, Pictor ac Incisor celeberrimus. Cesar Testa sc." "The Death of Dido, with Iris plucking off the Fatal Lock;" "The Centaur Chiron teaching Achilles to play on the Lyre, and throw the Javelin;" "The Emperor Titus consulting the Prophet Balaam on his Expedition against Jerusalem," from a picture by P. Testa, in the church of St. Martin du Mont, at Rome; all of large folio dimensions: and a very large and very rare print of "The Last Communion of St. Jerome;" from a picture by Dominichino, which has since been engraved by Farjat and Giacomo Frey.

Hyacinth, or Jacinto Gemignano, or Jeminiani, was born at Pistoia in the year 1611, from whence he travelled to Rome, and became the disciple of Pietro da Cortona. Here he resided for many years with great reputation. He afterwards returned to Pistoia, and died there at the age of seventy.

His plates are not numerous, and consist almost entirely of etchings, performed in a slight manner, and from his own compositions, of which the following are the chief.

A set of twelve, in quarto, of groups of children variously occupied; "Cleopatra dissolving the Pearl," in folio, and another folio plate from the reign of Semiramis, entitled "Semiramis jurat non nisi deviato hosti religatum capillos."

Giovanni Batista Bolognini was born at Bologna A.D. 1611, and died in the same city in the year 1688. He was instructed in the principles of painting by Guido, and soon became one of his best pupils. He painted in the style of his master, and his works are held in very great esteem.

We have many spirited etchings by Bolognini, from the compositions of Guido, which are executed in a slight style, resembling that of his master, but inferior in merit; among these, the following will probably be found most worthy of the collector's notice. "A Crucifixion," with St. John and the two Maries, standing at the foot of the cross, in folio; "Bacchus and Ariadne," a large print, lengthways, engraved on three plates; "St. Peter receiving the Keys;" and "The Murder of the Innocents," all of folio dimensions.

Salvator Rosa, (for an account of whom as a painter see ROSA, SALVATOR,) was born at Rinella, in the environs of Naples, A.D. 1615, and died at Rome in 1673. His etchings, though bold, present not the discriminating and characteristic ruggedness of his pencil. His drawing is incorrect; the heads of his figures are occasionally characteristic, but generally mean, but his chiaroscuro is broader and better than is to be found in the generality of the etchings of the Italian painters. Yet it is to be observed that, in point of executive power and feeling, his prints are far from being always alike. In his "Alexander visiting Diogenes," his line

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line is dry and inexpressive, while in his "Meditation of Democritus," and his allegorical print commonly known by the title of the "Genius of Salvator," he has entered much more into the detail of forms, and expressed the substances of the bones, reptiles, &c. which lie strewn about, with taste and with truth.

The cypher with which this great master marked his etchings, which amount to between eighty and ninety in number, all from his own compositions, will be found in our *Plate III.* of those of the *Italian School.*

The following list of his prints will be found nearly, if not quite, complete:—An octavo book, containing 60 plates of banditti, in various military and other dresses, some single figures, and others in groups; a set of six, consisting of tritons, nereids, and other marine monsters, in the lengthened proportion of friezes; a set of four, in small folio, of "Apollo and Daphne," "Glaucus and Scylla," "Ceres instructing Phytali in the Art of Agriculture," and "Jason and the Dragon;" of the same size are two plates of "St. William doing Penance," and "A Soldier sleeping on his Shield." "Plato with his Disciples in the Garden of Academus," "Diogenes throwing away his Cup," "Democritus meditating," "Alexander visiting the School of Apelles," and "Alexander visiting Diogenes," are of the same large folio dimensions: in the last, Salvator Rosa has committed a great and palpable blunder, for Diogenes is desiring Alexander not to intercept the rays of the sun, yet is himself placed between the sun and Alexander; an academy of philosophers, which is inscribed "Ingenius liber Pictor," and "The Genius of Salvator Rosa," are also in large folio; and in still larger folio are "The Execution of the Tyrant Polycrates," a very grand composition; "The Discovery of Œdipus on Mount Cytheron;" "The Death of Regulus;" and (of the upright form) "The Fall of the Giants."

Carlo Sacchi of Pavia, whom Strutt, by mistake, has called a native of Batavia, etched a few plates of small importance about this period. He was born in the year 1616, studied under Rosso, and died in his native city in 1706. "The Adoration of the Shepherds," from Tintoret, and "The wife Men's offering," from Paul Veronese, two large uprights, are among his best productions.

Now also lived Luigi, or Aloysius Scaramuccia, who obtained the addition of Perugino, from the place of his birth. He studied under Guido, and, as an historical painter, attained some eminence, but never reached beyond mediocrity as an engraver. Among his best prints are, "Christ crowned with Thorns," a folio plate after Titian; "Venus and Adonis," after Annibal Caracci; and a large folio print after Lodovico Caracci, from the legendary history of St. Benedict: The devil, it seems, had caused a large stone, which was to be used in building a certain church, to be immovable, and the saint broke the spell by the fervency of his prayers.

Of Benedetto Castiglione, an artist of very superior powers, who engraved several large plates at the period now under our review, we have already treated. (See CASTIGLIONE, GIOVANNO BENEDETTO.) His monogram may be seen in *Plate III.* of those of the *Italian Engravers*, and the following tasteful productions from his hand, may with advantage be added to those contained in our former list:—"The Genius of Castiglione," a folio print, which is generally placed as a frontispiece to collections of his works; a set of six heads, of which one is the portrait of the artist; "Tobit going forth to bury the Dead, with an Effect of Night," in folio; another from the history of Tobit, which appeared without a name, and is in clair-

obscur, is also ascribed to Castiglione; "The Adoration of the Shepherds; a night-scene with 'The Interment of St. Peter and St. Paul;'" another night-piece, with the effect of torch-light, of which the subject is "Philosophers visiting a Cemetery," all of folio dimensions; two of the proportions of a frieze, of which one is "Pan instructing Apollo on the Flute," and the other "Silenus with his Flute, and a Shepherdess playing the Tympanum;" "A Combat between two marine Horses;" "A drunken Silenus, with three Satyrs; a bacchanalian subject, with a satyr on the statue of Priapus; a menagerie of hens, turkey cocks, and drakes; a landscape, inscribed "Gio. Benedetto Castiglione. Gen. fec. 1658;" another landscape in form of a frieze; "A shepherd Boy watering his Flock;" "Shepherds riding and on foot, conducting their Flocks;" "A Capuchin Friar, marked with the letter T, discovering the Body of St. Jerome," in folio; and eleven small vignettes of various sizes, finished with the dry point.

Bernardino Capitelli was born at Sienna in the year 1617, and received instructions both from Calolani and Rutilius Manetti, but never attained to any considerable eminence. In his style of engraving, he mingled etching with the work of the graver, but his execution is coarse and heavy, and his outline incorrect. Among other plates of less importance, he engraved the life of the patron saint (Bernard) of his native city, on 12 small plates; "The Miracles of St. Anthony of Padua," a folio plate divided into compartments; "A Repose," from his master Rutilius Manetti; "The Marriage of St. Catherine," after Correggio; and "Ceres drinking at the Cottage Door," after Elshiemer, from the same picture which count Goudt has engraved in a very superior manner.

Giacomo Piccini, or Piccina, was born at Venice A.D. 1657. Under what master he studied is not known, but he worked chiefly with the graver, in a stiff laboured style, without much effect; and the outlines of his figures are exceedingly incorrect. His brother William was likewise a Venetian engraver, and engraved the portraits for the "Conchilia Aleste," of J. B. Fabri. Giacomo, on some of his plates, styles himself engraver to the king of France. The most considerable works he executed were a set of 30 portraits of the principal Venetian painters, affixed to an account of their lives by Carlo Ridolfi, published at Venice in 1648; most of the plates for a book, entitled "Le Glorie degli Incogniti;" a portrait of Alexander Farnese; "Diogenes, with his Lanthorn, sitting at the Entrance of his Tub," from P. Liberi; "A Holy Family," from the same painter; "Judith with the Head of Holofernes at her Feet," from Titian; and "A Holy Family," in a landscape, from the same, all of folio dimensions.

Giovanni Battista Galestrucci was born at Florence A.D. 1618. He learned the rudiments of painting of Francisco Furini, and was elected a member of the Academy of St. Luke at Rome, A.D. 1652. He is mentioned as a painter, but is much better known as an engraver. He engraved in a neat, correct, and masterly style, and was for some time the pupil of Della Bella, after whose death he finished some plates which had been begun by that master. His style bears some resemblance to that of Podesta. There are a great number of prints by his hand, which in general are marked with the cypher, which will be found in our *Plate III.* of the monograms of the *Italian Masters*, and of which Jean Jacques Rossi has given a catalogue.

Of these the most considerable are, a set of antique gems, in four volumes quarto, with explanations by Leonard Agostino, published at Rome in the years 1657 and 1659; several sets of antique bas-reliefs and friezes, from Polidoro Caravaggio,

Caravaggio, which appeared under the title of "Opere di Polidoro de Caravaggio;" "John Baptist beheaded in Prison," from Battista Ricci; "Paris receiving the Apple," and "The Caduceus of Mercury," from Annibal Caracci, both in quarto; and the Mausolea of the family of cardinal Mazarin; a set of six prints in folio, from the Abbe Elpidus Benedictus.

Giovanni Francesco Venturina was born at Rome in the year 1619, where he studied and resided for many years, but afterwards removed to Florence. To judge from the style of his works, it would appear that he was the disciple of Gailetrucci, or at least worked under his direction, after his removal to Florence. From the designs of that master, he has executed a good number of prints in a neat pleasing style, from which we select the following, as affording the most satisfactory specimens of his talents: "Diana and her Nymphs sporting," from Dominichino; "The Pulpit of St. Peter," from Bernini, in folio; a set of bird-eye views of palaces and gardens in and about Rome; and a set of fountains, from Rosa of Tivoli, being a continuation of the fountains in Rome, engraved by Faldia. He also engraved after Polydoro Caravaggio, and other painters.

Giovanni Batista Bonacini, or Bonacina, was born at Milan about the year 1620, and worked in his native country, and at Rome. His prints are executed in a stiff laboured style, entirely with the graver; and he appears to have studied in the school of Cornelius Bloemart; but he never arrived at any superior degree of excellence. Of his works we shall only mention the following: four portraits, in folio, of pope Clement IX., Guido Visconti, Ernes Visconti, and Giovanna Battista, Count Truchli; "The Alliance of Jacob and Laban," from Pietro de Cortona, in folio; "The Virgin with the Infant Jesus, and St. Martin kneeling before him," from the same master, which is esteemed a capital print, in large folio; another "Holy Family, with St. John and St. Catherine," a middling-sized upright plate, from Andrea del Sarto; and a medallion of pope Alexander VII., with an explication, from Bernini, in folio.

Flaminio Torre was born at Bologna A.D. 1621, and died at Modena in 1661. He learned the principles of painting from Cavedone, and completed his studies in the school of Guido. His chief excellence was in copying the pictures of the most celebrated masters, which he did so very exactly, as to render it nearly impossible to distinguish the copy from the original. He etched several plates in a good style; and he had copied the pictures of the Caracci, in the palace of count Fana, at Bologna, for the purpose of engraving them, when, at the age of forty, he died at Modena, whither he had been invited by the duke; and they were afterwards engraved by Metelli from Torre's copies. From among the prints of Torre we select the following, as most worthy of attention: "The Virgin and Child, accompanied by St. Francis and St. Jerome," a middling-sized upright, from Lodovico Caracci; "The Patron Saints of the City of Bologna," a large upright plate, from Guido; and "Pan conquered by Love," a small upright, from Agostino Caracci.

Pietro Francisko Mola merits a distinguished place both among the painters and engravers of the Italian school. He was born, according to some authors, at Codra, a village on the frontiers of the Milanese, in the year 1609: whilst others affirm that the place of his birth was Lugano, and the time 1621. From his childhood his talents were promising, and his father, who was a painter and architect, seconding these early dispositions toward the fine arts, placed

him first in the school of Josephine, and afterwards in that of Albano, at Rome.

When he quitted the latter, he travelled to Venice, and studied the works of Titian, Tintoretto, Bassan, and Paolo Veronese, with great assiduity, and with so much advantage, that it is said Guercchino became jealous of his progress, and that this jealousy occasioned his return to Rome, where queen Christina allowed him a pension, and where he was patronized by the popes Innocent X. and Alexander VII.

His friends seemed to multiply as his merits increased. He accepted an invitation to France from Louis XIV.; but during an altercation which he had with prince Pamfili, respecting the value of a ceiling which he had painted, he was seized with a violent paroxysm of headache, and expired in about six hours.

For an account of his peculiar merit as a painter, see the article MOLA. His etchings, though slight, are performed "with a master's hand and poet's fire." To a vigorous style of handling, he added correctness of drawing. He occasionally etched, as he painted, both landscape and history: his heads in the latter are beautifully characteristic, and carefully drawn; and in the former, his trees and his various grounds, &c. are touched with considerable taste.

"The Madonna suckling the Infant Saviour," a small upright, from his own composition; "A Holy Family, with Angels presenting Flowers to Jesus Christ," in folio, from Albano; "Joseph discovering himself to his Brethren," in small folio; and another "Holy Family with Angels," a folio print of the upright form, from his own composition; will be found among the best etchings of Francisco Mola.

Of the latter print, collectors should, if possible, obtain the impressions as the plate came from the hand of Mola; for it was afterwards worked upon with the graver by some unskilful person, who has much impaired the freedom and beauty of the etching.

Giovanni Baptista Mola, born in the year 1622, was brother to Francisco, and was also the disciple of Albano. He etched a few plates, the style of which bears a distant and inferior resemblance to that of his brother, as may be seen in a 4to. print, after Albano, of "Cupid drawn in his Chariot."

Carlo Cesio, or Cesius, was born at Antrodoco, a village in the late territory of the Roman pontiff, in 1626, and died at Rieti A.D. 1686. He studied as a painter under Pietro da Cortona, but is much better known by his engravings than by his pictures. His plates are chiefly etched and harmonized with the graver in a free and masterly manner. He drew correctly; and the extremities of his figures are in general finely marked, though slight, and in the broad, bold style of a painter.

Among the number of Cesio's engravings, which is considerable, the following will probably be found most worthy of selection: the frontispiece, in 4to., to "Discorsi della Musica;" and "The Holy Family," in an oval, both from his own compositions; two folio prints of "St. Andrew prostrating himself before the Cross," after a celebrated picture painted by Guido in conjunction with Dominichino; and "The Woman of Canaan," after Annibal Caracci; the Farnesian Gallery, consisting of forty-one plates, after the same master; the Pamphilian Gallery, consisting of fifteen plates, after Pietro da Cortona, of which the subject is "The History of Æneas;" "The Life of St. Augustine," after Lanfranc, consisting of four very large and four smaller folio prints, engraved from pictures which adorn the church of St. Augustine at Rome.

Andrea Podesta was born at Genoa in the year 1628, and became

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became the disciple of Andrea Ferrari. Strutt says, that "as a painter it does not appear that he greatly distinguished himself; but several spirited and masterly etchings, which he produced, prove him to have been a very skilful artist. The heads of his figures are finely characterized, and the other extremities are well expressed."

Among the best of Podetta's prints, which in general are marked either AND. P., or *And. P. in et fec.*, are the following: four Bacchanalian subjects, in large folio, after Titian, one of which is from the celebrated picture of "Bacchus leaping from his Car to greet Ariadne," which was lately in the collection of the earl of Kinnaird, and from which Mr. Bone has executed a most exquisite copy in enamel; "Love cultivating the Arts," an allegorical print in folio, dedicated to Guido; and a pair from "The Life of St. Diego," after Caracci, also in folio.

For an account of Carlo Maratti as a painter, see the article MARATTI. He was born at Camerino, in the marquise of Ancona, A.D. 1628, and died at Rome in 1713. Strutt says, with great justice of his etchings, that "they are executed in a free and spirited style; much neater, and better finished, than those of painters usually are. The characters of the heads of his figures are finely expressed;" and their graceful airs have been the subject of frequent commendation.

His engravings are somewhat numerous, and are held in great estimation. No collection of the works of the Italian masters should be without good impressions of the following:—A set of ten, from the Life of the Holy Virgin, after his own compositions, in quarto; "Heliodorus driven from the Temple," after Raphael, a large folio print, arched at the top, and engraven on two plates; "The Flagellation of St. Andrew," after Dominichino; "Joseph discovering himself to his Brethren," after Francisco Mola, of folio dimensions; "St. Charles Borromeus interceding for those afflicted with the Plague at Milan," a large upright, from Pietro Perugino; and (of the same form) "Christ discoursing with the Woman of Samaria," after Annibal Caracci; besides several plates of the Madonna and Bambino, of various sizes.

Giovanni Batista Cavazza was born at Bologna in the year 1620. He was successively the disciple of Cavedone and Guido, and painted several pictures for the churches of his native country. He likewise engraved some subjects for his amusement, among which are the following:—"Christ on the Cross;" "The Resurrection of Jesus Christ;" "The Death of St. Joseph;" and "The Assumption of the Virgin;" all of folio size.

Dominico Maria Canuti was born at Bologna A.D. 1623, and died in the same city in 1684. This extraordinary artist, by the force of his own natural genius, acquired so much knowledge of design and colouring, that Guido beheld his works with astonishment, and received him among his pupils with pleasure.

Besides his pictures, we have a good number of etchings by his hand, in the style of Guido, whom he surpassed in neatness, finishing, and boldness, if not truth, of fore-shortening, which has ever been held one of the difficulties of art; though, in the general excellency of his drawing, and the spirit of his outline, he has not equalled that great artist. He commonly marked his prints with his name, or initials, among them the following will probably be found most worthy of selection:—Three portraits of Ludovico, Augustino, and Annibal Caracci, in 4to.; "The Virgin seated in the Clouds, with Christ standing by her," a small upright print, from his own composition; "St. Roch;" and "St.

Francis praying," a small upright plate, from Guido, marked "Doms. Ma. Canuti fec."

Laurentio Passignelli was born at Bologna in the year 1629, and died at Parma in 1700. His instructors in the rudiments of art were Andrea Barone and Simon Cantarini, but he also frequented the school of Flaminio Torre. From Bologna he went to Turin, and from thence to Mantua and to Venice. At Mantua he was employed by the duke in the adornment of his castle at Monmirola, but at Venice, struck with the superiority which he perceived in Paul Veronese, his style of painting, and his notions of art in general, underwent a complete revolution. He afterwards returned to Bologna and established a school.

In Cochin's Italian Tour, he speaks highly of Passignelli's picture of "The Resurrection" in the church of St. Francis, and his few prints are sought after with justifiable avidity by the connoisseurs. They are chiefly from his own composition, and to the best of our knowledge "St. John preaching in the Wilderness," (a very fine etching,) and "The Martyrdom of various Saints," in one composition, afford the best specimens of his talents in this art; both are of large folio dimensions.

Of Luca Giordano, who was now living, we have already treated pretty much at large (see the article GIORDANO). His *fa presto* attended him in his voluntary offerings to engraving, as well as in his devotions to the filter art. Yet his taste allowed him to delineate the heads, hands, and feet in his etchings in a good style, and hence his works on copper are of a masterly character, though they possess not the fervency of the highest class of historical or epic compositions. His "Destruction of the Priesthood of Baal in the Presence of Elijah and Ahab," and "St. Anne received into Heaven by the Holy Virgin," which are both of folio dimensions, will at least justify thus much of approbation, as would also the following subjects from the Life of Christ, which are all in small folio, and from his own compositions. "The Holy Virgin and Infant Christ;" "St. Joseph and St. John;" "The Penitent Magdalen;" "Jesus Christ disputing with the Doctors;" and "The Woman taken in Adultery."

Horatio Brun, or Brunette, was born at Sienna A.D. 1630, but resided chiefly at Rome. He worked principally with the graver, imitating, though not very successfully, the style of F. de Poilly. "The Golden Age," "The four Seasons," "The Prodigal Son guarding Swine," a set of animals, all in folio, and an allegorical print of still larger dimensions, which has been called "Numa Pompilius, and the Nymph Egeria," are among the best of his engravings.

Lorenzo Tinti was born at Bologna in the year 1634, and was a disciple of Andrea Sirani. He was a painter of some merit, and he engraved many prints, among which is the frontispiece to the Herbal of D. Hyacinthe Ambrosini, which was printed at Bologna in 1666. He worked for some time at the court of Modena, where he engraved the pompous funeral of Francis I. duke of Modena, from Francisco Stringa. He also engraved from the celebrated masters of the Bolognese school, and from the pictures of Elizabeth Sirani.

Francisco Vaccaro, or Vaccari, was born at Bologna A.D. 1636. He studied under Albano, and wrote a treatise on perspective, for which he engraved the plates, and dedicated the work to counsellor Beccatelli. He likewise engraved a set of twelve perspective views of ruins, fountains, and edifices in Italy. He continued to flourish as an artist until the year 1670, after which we hear no more of him.

Giofesso Zarlatti was born at Modena A.D. 1635, and learned

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learned the rudimental principles of art of J. B. Spezzini, a Genoese painter. He was an engraver of merit, and executed some plates in a very spirited and pleasing style. His heads were generally beautiful, and his attitudes elegantly chosen. It is to be regretted that he died early, and engraved but little; nor are we able to specify any of his works.

The name of Bartoli, (for whose life see BARTOLI,) should have been honoured with a more ample list of his best productions than we were able to give at the time of publishing the third volume. The collector will probably be highly gratified to possess the following.

Various Antiques.—A set of thirty-three, intitled “*Admiranda Romanorum Antiquitatum ac veteris Sculpturæ Vestigia*,” with remarks by Bellori under each; a hundred and thirty-eight prints in folio, intitled “*Romanæ magnitudinis Monumenta*,” a set of fifty-two, intitled “*Veteres arcus Augustorum triumphis insignes*,” a set of seventy-eight in large folio, intitled “*Colonna di Marco Aurelio, con brevi note da Gio. Pietro Bellori*,” a set of one hundred and twenty-eight prints, intitled “*Colonna Trajana, di Alfonso Ciacconi*,” and another set, consisting of one hundred and thirty-two, intitled “*Sepolcri antichi Romani ed Etruschi, trovati in Roma*,” the aqueduct which conducts the water from Civita Vecchia, with various views in and about Rome, in four large prints; a grand sepulchral urn of stone, from the Capitol; two subjects from the Aldobrandini Marriage, intitled “*Nova Nupta in geniali Talamo*,” ninety-four in folio, intitled “*Le Pitture antiche delle Grotte di Romæ del Sepolcro de Nasoni, intagliate da Pietro Santi Bartoli & Francesco Bartoli suo figlio, Romæ*,” 1680 and 1706; a folio print, intitled “*Antiquissimi Virgiliani Codicis Fragmenta & Pictura*,” and a hundred and nineteen pieces, intitled “*Le Antiche Lucerne Sepolchrali*,” a collection of old pictures, correctly copied, from coloured drawings made by Bartoli, Paris.

After various Italian Masters.—A set of friezes, from the Bible, on the chimney-pieces of the Vatican, by Raphael, in twelve small pages; another set of the same, in fifteen leaves; another set, from Raphael, intitled “*Leonis X. admiranda virtutis imagines*,” a set of forty-three, of ornaments and figures, intitled “*Parerga atque ornamenta in Vaticani Palatii Kistis*,” by Raphael; a set of four, of the divinities in cars; “*Jupiter drawn by Eagles*,” “*Mars by Horfes*,” “*Diana by Nymphs*,” and “*Mercury by Cocks*,” the history of Constantine in friezes of different forms, from the Vatican. “*Giove che fulmina di Giganti*,” (Jupiter accompanied by all the Gods, destroying the Giants,) from the celebrated picture by Julio Romano, at the palace of T at Mantua, in nine leaves; “*The History of St. Peter*,” from Lanfranc, in folio.

Various separate Subjects from Italian Masters.—“*The Adoration of the Kings*,” from Raphael, (engraved on three plates,) of large folio; one of the finest productions of Bartoli; “*The Infant Jupiter nourished by the Goat Amalthæa*,” from Julio Romano; “*Hylas stolen by the Nymphs*,” “*Sophonisba presented to Massinissa*,” “*The Continnence of Scipio*,” all of folio size, from the same painter; “*St. John shewing Christ in the Desert*,” from P. F. Mola; “*The Birth of the Virgin*,” from Albano; “*The Marriage of the Virgin*,” from a picture by Nicolò Beretoni, in the church of St. Lorcuzo in Borgo; “*Daniel in the Lion’s Den*,” after an altar-piece by P. de Cortona; “*The Virgin in Heaven with the Infant Jesus, and Saints*,” from L. Caracci, all of folio dimensions; “*The Mother and Wife of Coriolanus prostrate at his Feet*,” “*St. Charles Borromeus brought by an Angel to the Tomb of Vetallo*,” both from Ann. Caracci.

The following are from his own Designs.—An oval, in 4to. of “*St. Stephen receiving the Crown of Martyrdom*,” “*St. Bernard chaining Satan*,” a large folio print of the theatre erected in the cathedral of St. Peter, for the canonization of St. Peter of Alcantore, and “*Mary Magdalen*,” engraved conjointly with Falda; the sepulchral monument of pope Urban VIII. inscribed “*Petr. Sanct. Bartolus del et sc.*,” and an ancient mansoleum, from Tivoli, with the figure of a lion, from P. de Cortona, in large folio.

The grand catafalco, or funeral procession of Sobieski, king of Poland, after Sebastian Cipriani, in large folio, was engraven by Francesco Bartoli, a Roman by birth, and the son, pupil, and successor of Pietro Sante, who sometimes worked on his father’s plates, but was inferior to him in talent and reputation.

Giovanni Baptista Falda, a very excellent engraver of landscape and architecture, was born, in the year 1640, at Valduggia, in the Milanese, from whence he travelled, for professional improvement, to Rome. Whose disciple he was does not appear; but he executed his plates in a clear neat style, bearing no small resemblance to that of Israel Silvestre. He drew and engraved a great number of views of palaces, churches, gardens, &c. in Rome and its environs, which he enriched with small figures, drawn and engraved with great taste. And in the year 1676 he engraved a very large view of Rome on twelve plates. His works are numerous, and deservedly held in high estimation. Among them the following will be found to deserve the particular notice of the connoisseur. Two fine views of the square of Navonne, intitled “*Fontana in Piazza Navonna*,” and “*Altra Veduta in Piazza Navonna*,” erected by Bernini, in folio. Two other views, in large folio, of the Basilico at the Vatican, and the fountain of the Basilico. A very large view, lengthways, of St. Peter’s, with twelve of the most celebrated edifices in Rome, on the same plate, very rare. A view of the interior of St. Peter of the Vatican, with the beatification of St. Francis of Sales, in large folio; and a very large view of the castle and bridge of St. Angelo, from Bernini.

Matteo Thommaso Piccioni was born at Ancona A. D. 1637, and became a member of the Academy of St. Luke in the year 1655. Piccioni holds a distinguished rank among those artists who worked in Mosaic, and executed in that style the pictures of the cupola of the chapel of St. Peter at Rome, in conjunction with Fabius Christopheri and Horace Manenti. He etched some few plates, among which are the following, all of folio size. “*St. Luke painting the Virgin*,” from a picture by Raphael; “*The Adoration of the Shepherds*,” from Paul Veronese; “*A Holy Family*,” from the same painter; “*The Virgin with the Infant Christ, who is represented sleeping, and St. John at his side*,” from Andrea Camasici; and “*The Infant Moses carried by his Mother in the Ark of Bulrushes*,” from the same painter.

Dominica Maria Bonarcra was born at Bologna about the beginning of the last century: he learned the principles of drawing and etching of his uncle, D. M. Canuti. Among his works, those that he executed after Titian for an edition of the anatomical work by Vesalius, for the use of students, are the most esteemed, many of which, after being etched, were finished with the dry point. A monogram, which was common to him and Dominic Barriere, will be found in our Plate III. of those used by the *Italian Engravers*; and the following are selected from the catalogues of his works, as those most worthy attention; “*St. Ann teaching the young Virgin Mary to read*,” from Dom. M. Canuti, in folio; “*St. Theresia with the Infant Christ*,” “*The Martyr-*

Martyrdom of St. Christiana," all of the same size, from Canuti; "St. John baptizing Christ in the River Jordan," from Albano, in large folio; "St. John preaching on the Banks of the Jordan," from L. Caracci; "Lot with his Daughters," from Ann. Caracci; and the dome of the cathedral church at Parma, representing "The Assumption of the Virgin, with the Apostles and Angels," from Correggio, all in large folio.

Ambrogio Beozzi, or Bezutius, an eminent painter and engraver in aquafortis, was born at Milan A. D. 1648, and died in the same city in 1706. He studied for some time under Gioseffo Danedi, called Montalti, but afterwards went to Rome, where he studied from the antiques and the most celebrated pictures, and lastly, in the school of Ciro Ferri. His greatest merit consisted in painting bas-reliefs, friezes, and other architectural decorations; but he etched some few plates, and among them the following. A portrait of Correggio, in profile, of 4to. size; and the apotheosis of a princess, the bust of whom was engraved by Bonacina, and the remainder by Befozzi, from Cesare Fiori, in folio.

Girolamo, or Jerome Rossi, or de Rubeis, the elder, was born at Rome A. D. 1640. He learned the principles of art under Simon Cantarini, and J. B. Buoncone. He executed a few slight but meritorious etchings from various Bolognese painters, among which are the following. A portrait of pope Pius V., from Scipio Gatana, in an oval; "Two Cupids playing together," a small upright plate from Guercino; "The Virgin and Child, accompanied by St. Francis and St. Jerome," a middling-sized upright plate, inscribed "Hieronymus de Rubeis pictor delineavit incidit;" "St. Charles Borromens kneeling before a Cross," from Antonio Caracci, a rare print; and "St. Nicholas before the Virgin," from Francis Bonavilla, both in large folio.

Girolamo Rossi, or de Rubeis, the younger, was born at Rome A. D. 1685, and was probably a relation of the above-mentioned artist. He always resided at Rome, and engraved a considerable number of prints, after different Italian painters. He worked in a stiff heavy style, with the graver alone, without much effect or correctness of drawing, and engraved a considerable number of portraits of the cardinals of his time; forming a series, which has since been continued by Pazzi and others. Rossi likewise engraved some portraits of painters for the Florentine gallery. His best historical works are, "The Virgin and Child," from Correggio; "La Zingara, or the Repose in Egypt," where the Virgin is dressed in the Egyptian fashion, from a picture by Ann. Caracci, both in folio; and "The Martyrdom of St. Agapita," a large plate, lengthways, from J. Odazzi.

Giovanni Battista Testana, was born at Genoa in the year 1649, and resided chiefly at Rome, where he engraved many plates from the pictures of various Italian masters. In conjunction with William Vallet and Stephen Picart, he executed the portraits of the heroes of antiquity, for Jean Angelo Canini, from antique gems and medals. He engraved in a very pleasing style, not unlike that of Meilan. The following prints afford satisfactory specimens of his talents. Two heads, of Socrates and Alexander; and another pair of Aspasia and Cleopatra, in 4to., for the work of Canini; "The Guardian Angel," in large folio, from Pietro da Cortona; and "The Baptism of Constantine the Great," from Aug. Caracci, of the same size.

Gioseffo Testana was born at Genoa in the year 1650. Whether he was the brother, or how he was related to the above-mentioned artist, we are unable to ascertain. He resided at Rome, where he engraved many plates in the style of Giovanni Battista. He was employed in a work which appeared at Rome in 1680, under the title of "Portraits

of Cardinals now living," and from the rest of his works the following may be selected as affording specimens of his abilities both in portrait and history. A portrait of brother Jerome Comitibus, from P. de Cortona, in folio; "St. Margaret of Cortona kneeling before a Crucifix;" a subject of a Theses, representing a Hydra, and Religion hovering in the air, holding a portrait of pope Alexander VII. On a little streamer is the following inscription; "Accedite et illuminamini," both from Cortona, of folio size; and two portraits, Flavius Card. Chifius, after M. Morandi, and Aloysius Card. Homodeus, Jos. Testana del. et scu. both in 4to.

Crecentius de Hunufris, or de Onofriis, was born at Rome in the year 1650, and died at Florence some time about the close of the seventeenth century. He was the pupil of Gaspar Poussin, and painted a great number of landscapes in the style of that master.

He also engraved landscape in a very good taste, and we have an engraving by him, from a picture by Carlo Maratti, of "Diana at the Chace," for the prince Livius Odescalchi, which is executed with freedom, and in a purity of style superior to most of the landscape engravings of that day. This, and a landscape with a waterfall; an Italian landscape with water and figures, (both in folio,) and two heroic landscapes, one with Jupiter and Mercury, the other with Apollo in the clouds, both in large folio, afford excellent examples of the talents of this artist.

Giovanno Gioseffo dal Sole, was a native of Bologna, and became both a painter and engraver of some eminence. He received his first instructions of D. M. Canuti, and afterwards became the pupil of Lorenzo Pasinelli. He succeeded in engraving both historical subjects and landscapes; and died at Bologna A. D. 1719, aged sixty-five years. We have several etchings by him, from his own compositions, among which are, "Jupiter and Juno presenting Mars with a Buckler," from a ceiling by Pasinelli, painted for General Monteculle, in folio; and "St. Francis Xavier preaching in the Indies," a large upright plate, from the same master.

Vincent Vittoria, or Vittoria, was born at Valencia A. D. 1658. He travelled whilst very young to Rome, and frequented the school of Carlo Maratti, where he made great progress. He possessed considerable knowledge of anatomy, and his portraits are particularly esteemed. Vittoria is likewise celebrated as an antiquary and a connoisseur in works of ancient art; and possessed an excellent cabinet of gems, medals, and various antiquities; he was honoured with the titles of antiquarian to the pope, and first painter to the grand duke of Tuscany. Among other literary productions, Vittoria is the author of "Osservazioni, sopra la Felsina pittrice de Malvasia," a work which the celebrated J. P. Zanotti has endeavoured to refute. The portrait of our artist may be seen in the collection of those of the great painters of the Florentine school. He died at Rome A. D. 1712, aged 51 years. Among many prints that he etched in a slight style, the following are the best, "The Virgin and Child in the Clouds, with John the Baptist, St. Francis, and other holy Personages below," from Raphael, inscribed "Vinc. Vittoria del. et sculpt." rare; "The Last Supper," and "The Resurrection," both in large folio, from Ciro Ferri.

Giovanni Girolamo Frezza, was born at Canemorde, near Tivoli, in the year 1660. He learned engraving at Rome, under Arnold de Welterhout, and executed a great number of prints, after various Italian masters, in a neat careful style, finished highly with the graver; but without any force of chiaro-scuro, or boldness of execution. Sometimes Frezza imitated that style of Meilan, which consists of single courses

of lines, yet not very successfully, and we are obliged to say of his numerous productions, that the extremities of his figures in general are but poorly marked, and his drawing, though not very incorrect, is sometimes heavy. Among his engravings the following are held in most esteem. The Verosian gallery, consisting of seventeen folio plates, including the title, from Albano, published at Rome in 1704; "The Virgin sitting under a Tree feeding the Infant Christ," from L. Caracci; "A Holy Family, with the Infant naked in the Arms of the Virgin," from Carlo Maratti, both in folio; "The Assumption of the Virgin," dedicated to pope Clement XI.; and "The Judgment of Paris," dedicated to the marquis Pallavicino, both from the same master, of folio size; "La Zingare," or the Repose in Egypt, where the Holy Virgin is represented in Egyptian attire, from Correggio, in large folio; a middling-sized upright plate of "The Descent of the Holy Ghost," from Guido, very rare; "Polypheme on a Rock, and Galatea on the Water with Nymphs," a folio print; "Polypheme hurling a Rock after Acis and Galatea," in two plates. A set of six, including the title, from pictures in the chapel of St. Ann, in the church of the Madonna, at Monte Santo, from Nicolo Beretoni, in folio. The first and second plates for the Crozat collection, one representing "Venus," the other "Pallas," from antique paintings, in large folio, and the celebrated Centaurs (known by the name of Furietto), done by Aristeas and Papias of Aphrodisium; and preserved in the museum Clementinum, from drawings by P. Battoni, and N. Honopri, in large folio.

Gioseffo Diamantini was born at Romania A. D. 1660, and spent the greater part of his life at Venice, where he died in the year 1722. Heinnekin, who has left us a catalogue of his etchings, seems to say of this master, that his greatest praise was having instructed Rosa Alba Carriera. Yet, according to Strutt, who professes, however, to have seen but few of his works, "Diamantini etched in a free masterly style, with a fine point; the designs are spirited; the actions of the figures are often very graceful, and the heads and other extremities of them drawn in a superior style."

He was honoured with the title of chevalier, and hence he often marked his prints, "Eques Diamantinus in. f." The following are among the best of his works, almost all from his own compositions. "Hagar in the Desert," in an oval, of quarto size; "A Holy Family, with St. John," in folio; "The Marriage of Canaan," from Paul Veronese, in folio; "The dead Body of Christ, supported on the Tomb by an Angel," in an oval, dedicated to Gregorio Fab.; "Dido on the Funeral Pile, with Diana or Iris in the Air," in an octagon; "Venus, Ceres, and Pomona," dedicated to D. D. Ferdinand; "Mercury and Flora in the Air," dedicated to D. Aloysius Pisani; "Night pursued by Phosphorus, or the Morning Star," dedicated to Marc Angelo Flavio Commeni; "The Sphere, or Astronomy," dedicated to Angelis, all of folio size; "Saturn, or a river God, with two Cupids," of octagon form; a middling-sized upright print of "The Fall of Phaeton;" a small octagonal print of "Mercury and Argus;" "Venus and Adonis," an octagon; another "Venus and Adonis," in quarto; a small octagon of "Jupiter and the Republic of Venice;" a small upright print of "Time, or a river God sitting, and a Child, with his Eyes bandaged, lying near him, accompanied by a Muse;" a middling-sized upright print of "Time and Flora, crowned by a Genius;" "Strength, or Hercules sitting by a Nymph, accompanied by Plenty," in an octagon; a small upright print of "Mars and Venus;" two more small uprights of "Diana and Endymion;" and

"The Sacrifice of Iphigenia;" "Boreas stealing away Orithrea," in a folio octagon; a small oval print of "Justice and Peace;" four small upright emblematical subjects; two large square ditto; and two other emblematical subjects, one a large hexagonal plate, and the other an oval.

Gioseffo Niccolo Nafini was born at a short distance from Sienna, A.D. 1660. He learned the rudiments of art from his father Francisco Nafini, but was sent to Rome at the age of eighteen, and entered the school of Ciro Ferri, under whom he studied two years, and acquired not only great command of the pencil, but a fine taste for design. He was recommended by his master to the grand duke Cosmo III., for whom he copied the pictures of Pietro da Cortona, in the Pitti palace; in which he succeeded so well, that the duke rewarded him very handsomely. He was likewise honoured with knighthood by the emperor Leopold, and had many other favours conferred on him by the great.

The style of Nafini bears some resemblance to that of Paul Veronese. He died at Sienna in 1736, aged seventy-six. We have one small upright etching by this artist, representing "The Virgin with the Infant Christ and St. John," from a composition of his own.

Cesar Fantetti was born at Florence A.D. 1660. The time of his decease has not been recorded, and of the events of his life it is only known that he worked at Rome after various Italian masters.

He engraved, in conjunction with Pietro Aquila, the paintings in the Vatican, known under the name of Raphael's Bible; the first thirty-six, and the fortieth, are etched by him, and the remaining fifteen by P. Aquila. Fantetti also engraved "Christ praying in the Garden of Olives," in folio, from L. Caracci; "Charity, with Two Children," from Ann. Caracci; "Latona insulted by Niobe," in large folio, from the same painter; "The Death of St. Ann," of the same size, from Andrea Sacchi; and "Flora surrounded with Cupids in the Air," from Ciro Ferri; in an oval of folio size.

Francisco Bruni was a native of Genoa, and an engraver. He was born in the year 1660, and died in 1726, but we are not acquainted with the particulars of his life, and we only know of the following print by him, "The Assumption of the Virgin," in large folio, from Guido.

Lodovico Mattioli was born A.D. 1662, at Crevalcone, in the principality of Masseran, and died at Bologna in 1741. At an early age he was sent to study in the school of Carlo Cignani. He drew with a pen in a very pleasing style; and etched from his own compositions and those of the Caracci, and other great masters, but especially after G. M. Crespi, with whom he contracted a very intimate friendship. Among the etchings of Mattioli, the following will be found most worthy of notice: a landscape, with ruins and figures, in quarto; "The Annunciation," from L. Caracci, of the same size, a very rare print; "The Circumcision," in folio, from the same; "The Nativity," from Aug. Caracci, of the same size; "The good Samaritan," from Ann. Caracci; "The Death of St. Joseph," from Franceschini; "The Martyrdom of St. Peter," from Crespi; a figure of "St. Anthony," and mother of "St. Vincent Ferrer," all of folio size, from Crespi; "St. Luke," a note of invitation engraved by Crespi, and re-engraved by Mattioli. And the figures for the poem of Bertoldo con Bertoldino, in twenty sheets, were drawn by Crespi, and engraved under the direction of Mattioli.

William da Leone was born at Parma in the year 1664. He etched, from his own designs, two sets of animals, which are executed in a spirited style, and with some taste; we are able only to specify, in addition to these, the following en-

gravings by Leone: two landscapes, with animals, in quarto, and "Venus blinding Cupid," from Titian, in folio.

Luca Carlevaris, surnamed Zenobio, was born at Udino, in Italy, A.D. 1665, and died at Venice in 1729. He excelled in painting landscapes and marine subjects. He likewise engraved a set of views of Venice, consisting of one hundred large plates lengthways, which were published in 1705. His prints are slight, but bold and spirited etchings; and give us clear ideas of the places they are intended to represent. We can only specify the titles of the following two: a view of the church of St. Nicolas de Castello, at Venice; and one of St. Marie Formosa, at the same place, both in folio.

Of the family of CRESPI we have already spoken, as fee that article. Gioseffo Maria employed a long life of upwards of fourscore years, in the practice of the various arts of which imitation is the basis, in the course of which he etched several plates, which do credit to his general reputation, and which we omitted to mention in vol. x. Among them we venture to recommend the following as most worthy of the notice of the connoisseur.

A grand composition, in large folio, of "The Massacre of the Innocents;" two folio plates in the manner of Rembrandt, of which "The Resurrection" is the subject; "The miraculous Crucifixion of Pistoia;" "St. Anthony," also in the manner of Rembrandt, and of the oval form; a folio plate of "Two Shepherds," one of them asleep, and the other making the sign of silence. A set of five, in the taste of Salvator Rosa, of various mechanical occupations; and a very rare portrait of Michael Angelo Tamburini.

Pietro da Pietri, or Pitri, was born A.D. 1665, according to some authors, at Rome; others place his birth at Premia, in the Milanese territory. He learned the principles of art of Jos. Ghezzi and Carlo Maratti, who employed him in copying some of the principal works of Raphael, and other celebrated Italian masters. He died at Rome in the year 1716.

Notwithstanding that Pietri employed great part of his time in copying, we have several meritorious historical pictures by him from his own compositions; those especially, which he painted for the church of St. Clement at Rome. He etched some few plates, and among them the two following will probably be found most worthy of notice. "The Assumption of the Virgin," a middling-sized upright; and "St. Lawrence the Justinian," a small upright, both from his own compositions.

Francesco Antonio Lorenzini, known by the name of brother Antonio, was born at Bologna A.D. 1665. He was an ecclesiastic of the order of St. Francis; but turning his mind to the arts, he first studied painting under Lorenzo Pasinelli: being, however, better pleased with etching, he was induced to throw aside his pencils for the love of aquafortis and copper.

In 1699 he travelled to Florence, where he engraved great part of the plates for the gallery of the grand duke of Tuscany, in conjunction with Theodore Ver-Cruys, Cosmo Mogalli, and Fichianti; and during his absence from Bologna, he was agreeably surprised by finding himself elected a member of the Clementine academy. Lorenzini was a very industrious man, and left a great number of prints from different masters: which, however, it must be acknowledged do him no great credit as an artist; among them the following are the best: "Moses striking the Rock," a large plate lengthways, from Bassan; "St. Anthony of Padua performing a Miracle," from Pasinelli; "The Martyrdom of St. Ursula and her Companions;" "St. John preaching in the Desert," all of large folio size, from Pasinelli; "Jesus

Christ in a Glory," with other figures, from L. Caracci; "The Virgin and Child," half figures, from Aug. Caracci, both in folio; "The Beatification of St. Dominic, accompanied by Jesus Christ, the Virgin, and Angels," from Guido, a large circular plate; "St. Philip Neri kneeling before a picture of the Virgin, surrounded by Angels," from Carlo Maratti; "St. John in the Clouds, surrounded by Angels," from Correggio, both in large folio; "The Annunciation," from Paul Veronese, in large folio; "The Baptism of our Saviour," of the same size; "The Resuscitation of Lazarus," on three large plates, all from Paul Veronese; "Jesus Christ on the Sea with St. Peter," from L. Cordi; "The Construction of Noah's Ark," from Jac. Bassano; "Venus with Two Cupids," from Carlo Cignani; "St. Augustino in the Air, surrounded by Rays of Glory," from Tintoret, all of large folio size; "Joseph sold by his Brethren," after Andrea del Sarto, in two large folio leaves; "Joseph in Egypt;" "Saul and David with the Head of Goliath," from Guercino; "The Pilgrims at Emaus;" "St. Peter delivered from Prison," both from the same painter, all in folio; "The Holy Women at the Sepulchre," from P. de Cortona, a circular print; and "St. Margaret of Cortona, to whom the Virgin appears in the Clouds," from Gab. Caliari, in large folio.

The monogram of Antonio Balestra will be found in our Plate III. of those used by the *Italian Engravers*. Of the leading events of his life we have already treated. (See BALESTRA.) His style of etching was bold and masterly, though slight; and his most esteemed prints are, a warrior's head, and two soldiers, both small plates; "The Holy Virgin seated in the Clouds, with the Infant Jesus and St. John, the Heads of three Cherubs appearing above;" "The three Angels visiting Abraham;" a vignette inscribed "Verona fidelis," all small uprights, and rare. His portrait of the architect Michel San Michell, surrounded with allegorical allusions, and marked with the engraver's monogram, is in small folio.

Benedetto Lutti was an eminent painter of Florence, who sometimes amused himself with etching, and whose works are generally and justly esteemed. He was born in the year 1666, studied under Antonio Domenico Gabbiani, and died at Rome in 1724.

Strutt says of this artist, that his merits procured him, from the elector of Mentz, the honour of knighthood, accompanied by a present of a cross enriched with diamonds, but specifies only two of his etchings, both of which are become extremely rare. The subjects of these etchings are, a landscape after Guercino, in small folio; and "The Crucifixion, with St. John and Mary Magdalen at the Foot of the Cross," a small upright, from a composition by Lutti himself.

Cosmo Mogalli was a native of Italy, and the disciple of Giovanni Battista Foggini, a Florentine sculptor. He was born at Florence in the year 1667, and died in the same city in 1730. He worked in conjunction with Antonio Lorenzini, (of whom we have recently treated,) and other engravers, on the plates from the Florentine gallery, for the duke of Tuscany. We likewise have by him many plates for a book of Etruscan antiquities, published by Thomas Dempster, at Florence, in 1724.

The following prints, from the Florentine gallery, are from the graver of the elder Mogalli, viz. "A Holy Family, or the Repose in Egypt," from Albano, a circular print in folio; another "Holy Family," from Correggio, of the same size; "The Supplication of Marfias," from Guercino, in large folio; "Eve presenting the Apple to Adam," from Gabr. Caliari, in folio; "The penitent Magdalen

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Magdalen translated to Heaven by an Angel," from Caracci, in large folio; "Adam and Eve dismissed from Paradise," from Caliarì, in folio; "St. Benedict instituting his monastic Order," from P. Veronese; "Jesus Christ at the Table with the Pilgrims of Emaus," from Palma the elder; "The Marriage of St. Catherine," from Fra. Bartolomeo, all in large folio; "Virtutes Amor et Numen," an allegorical figure from Riminaldi, in folio; "David and Bathsheba," from Fr. Salviati; this and all the following are in large folio; "The Annunciation," from And. del Sarto; "The Adoration of the Shepherds," from Titian; a bacchanalian dance by four figures; and Philip II. king of Spain, also from the same painter.

Nicolas Mogalli was the son of Cosmo, and also an engraver. He was born at Florence in the year 1723, from whence, either for improvement or patronage, he travelled to Rome, where he engraved, with moderate success, from the cabinet of Portici, and the plates, after the designs of Canova, for "Les Monumens antiques inédits expliqués et illustrés par Giovanni Winkelman," a folio work, which was published at Rome in the year 1767.

Jacques Maria Giovanni, or Juvanus, was born at Bologna in the year 1667, and died at Parma in 1717. He was the disciple of Antonio Roli, and became a painter of some eminence. He also practised engraving and etching, and executed many large works from L. Caracci and Correggio. The most considerable work he engaged in was a cabinet of medals for the duke of Parma, in several folio volumes. His prints are of very unequal merits. As far as they can be spoken of generally, they are executed with tolerable care and skill, but are deficient in chiaroscuro, and more or less so in drawing. The best of them are engraved from the pictures of the cloisters of St. Michael in Bolso, painted by L. Caracci, and other celebrated masters of his school, on 19 plates in folio; the cupola of the church of St. John of the Benedicines at Parma, representing "The Ascension of our Saviour," &c. &c. on 12 plates, from those justly famed pictures by Correggio, which can now only be known by the engravings, the paintings themselves being no longer in existence; the Holy Virgin in a landscape, with the Infant Christ in her arms, with St. Jerome and Mary Magdalen, the latter of whom is kissing the feet of the child (a subject commonly known under the name of "The Day of Correggio"); the Virgin seated on a pedestal with the Infant Christ, known by the name of "St. George," who is the principal figure, and by some esteemed the chef-d'œuvre of Correggio; "St. Sebastian fastened to a Tree with his Hands behind his Back," in folio, from Caracci; "Jesus Christ giving the Communion to his Apostles," from Franceschini, a very excellent print of large dimensions, and of the upright form.

Andrea Procaccini was born at Rome in the year 1667, and was the pupil of Carlo Maratti. He became a painter of some celebrity, and was chosen by pope Clement XI. to paint the twelve prophets of the Old Testament, for the church of St. John de Lateran. In 1720, he was invited to Spain, with the title of painter to the Royal Cabinet. Here he painted several pictures for the royal palace, and died at St. Ildefonso, A.D. 1734. We have several engravings by this master, both from his own compositions, and those of other painters, among which the following few are selected as most worthy of the notice of the collector:—"The Disciples at Emaus," from Raphael; "The Ascension of our Saviour," a large group of figures, with a youth carrying his father on his shoulders, both from Raphael; "The Birth of Bacchus;" "Diogenes throwing away his Cup;" and "Cielus and his Companions passing

the Tiber," all from Carlo Maratti, and of folio dimensions.

Giovanni Dominico Picchianti was born at Venice A.D. 1670, and was the scholar of J. B. Foggini, a sculptor of some eminence. The productions of Picchianti have no great share of excellence to recommend them, for he worked in a coarse slight style, and his drawing is rather mannered than correct. He engraved many of the plates from the pictures in the grand Florentine gallery, in conjunction with Lorenzini, Ver-Cruys, and Mogalli; and likewise some portraits, among which are, those of an unknown female, from Raphael, in folio, a whole length of Sebastian del Piombo, from Titian, and cardinal Bentivoglio, from Vandyke; those of cardinals Louis de Rossi and Julius de Medicis, on the same plate, are from Raphael, and all are of large folio size.

The best historical works of Picchianti are, "The Virgin sitting on a Chair," or the celebrated Madonna della Sedia of Raphael; a half figure of "The Virgin, with the Infant Jesus, and St. John," from Caracci, in folio; "Paying Tribute to Cæsar," commonly called "Il Cristo della Monetta," from Titian; "The Virgin and Child," from the same painter; and "Agar returning to the House of Abraham," from P. de Cortona, all of large folio dimensions.

Francisco Antonio Meloni was a native of Bologna, and born in the year 1670. At an early age he appeared fond of painting, and was accordingly placed under Franceschini; but time discovered that his disposition was not formed for the attainment of excellence in that art, and he then took up the graver with much better success. He engraved chiefly from the pictures of his master, and other Bolognese painters; but the latter years of his life were spent at Vienna, where he died in the year 1713. The following are reckoned among his best engravings:—"The Adoration of the Shepherds," a middling-sized upright plate, from Carlo Cignani; and "Aurora," from a ceiling at Forlì by the same master, both in folio.

Of the merits of FRANCISCO and PIETRO AQUILA we have already treated. (See those biographical articles respectively.) But of artists so distinguished it has been judged proper to subjoin, in this place, lists of the principal works on which their reputation has been founded. The best of those by the elder Aquila are "Saint Rosalie," from his own composition, in folio; "Mars binding his Arms to a Tree," in large folio; "Cardinal Casini as a Capuchin," in folio; "Cardinal Joseph Maria of Thomas," from P. Nelli, of the same size; "The Last Supper," from Albano, inscribed "Unus ex vobis, &c." in large folio; the first vaulted roof of mosaic in the church of the Vatican, from Ciro Ferri; two cupolas, one in the chapel of the Holy Sacrament, the other in the church of St. Sebastian of the Vatican, from P. de Cortona; another cupola, from the same master, painted in the church of St. Philip of Neri, all large circular prints; a group of heroes, to whom Minerva presents a crown of laurel, and Mars a sword, a folio print, from And. Bonfigli; "The Battle of Constantine and Maxentius," from And. Camassei; and "The Triumph of Constantine," both very large; "The dead Body of Christ across the Knees of his Mother, accompanied by Mary Magdalen and St. Francis," from Caracci, in large folio; "The Arrival of the Body of St. Helena announced by a Bishop to the Virgin," in folio; "The Repose," where the holy Virgin is represented seated under a tree with the infant, and in the back-ground St. Joseph on his ass; "St. Peter's Bark," from Lanfranc, in large folio; a very large folio print of "Our Saviour in a Glory," with

with St. Ambrose, the Virgin, and St. Charles Borromeus, kneeling," from a grand altar-piece by Carlo Maratti; the vaulted ceiling of St. Francis Xavier at Naples, painted by Paul de Mattheis, and engraved on three large plates, representing that saint overturning Idolatry, Heresy, and Mahometanism; "Venus in the Air, showing Æneas his Arms fastened to a Tree," from Poussin.

The following are by Pietro Aquila, from his own designs: "The Adoration of the Kings," in folio; "The Flight into Egypt," dedicated to B. C. de Vingtimillii, in large folio; "A Holy Family, where St. John kisses the Feet of the Infant Christ," half figures, in folio; "A Combat of two Lions," inscribed "Spe fuscitat Iras," in folio; a portrait of Livio Odescalchi, with ornaments, in large folio.

From other Italian masters, Pietro has engraven "St. Luke," with the inscription "Ferox cum feriant," &c. after Lazaro Baldi, in folio; "The Sacrifice of Polixenes," from P. de Cortona, in large folio; "A Sacrifice of the Nymphs of Diana on their return from the Chase," "The Rape of the Sabines," and "The Triumph of Bacchus," four very much esteemed prints, all from the same master, in large folio; a large subject on two plates of "The Battle between Alexander and Darius," from the same master; "Moses defending the Daughters of Jethro, at the Fountain," from Ciro Ferri; "Moses striking the Rock," both in large folio; "The Holy Virgin appearing to St. Alezio, who is reposing on a Bed, crowned with Stars," a large circular print; "The Vestals cherishing the sacred Fire, by the Orders of Angellus," a large upright print, all from Ciro Ferri; "The Holy Virgin in Heaven with five Saints, canonized by Pope Clement X." from Carlo Maratti, in large folio; "The Triumph of Christianity, represented by Religion sitting on the Clouds, receiving the Homage of the four Quarters of the World," in large folio; "The Virgin sitting to St. Luke for her Portrait," in folio, all from Carlo Maratti; "Death and the Holy Virgin, with the Apostles," from J. Morandi, in large folio; the Bible of Raphael, inscribed "Imagines Veteris ac Novi Testamenti, a Raphaele Sanct. Urbin. in Vaticano pictæ Jo. Jac. de Rubens sumitibus," in fifty-five leaves. Cesare Fantetti drew and engraved the first thirty-six subjects, and the fortieth; all the others are by P. Aquila. The Farnese Gallery, with the statues and ornaments, and a description in verse by J. P. Bellori, in twenty-five leaves, of large folio size; a room in the Farnese palace, with the ornaments and inscriptions, in thirteen plates, of folio size; "The Assembly of the Gods," painted in the garden of the prince Borghese near Rome, called "The Villa Pinciana," entitled "Deorum Concilium ab Equite Joanno Lanfranco Parmensi, tum Spirantibus ad vivum Imaginibus, tum monocromatibus atque Ornamentis Artis," &c. on nine large folio plates.

Marco Ricci, the celebrated painter of landscape and ruined edifices, (for whose biography and general merits, see the article Ricci,) performed some etchings about this period, of which the best are a set of twenty-three, entitled "Varia Marci Ricci Pictoris præstantissimi Experimenta ab ipsomet auctore inventa delineata atque incisa et a me Carolo Orsolini Veneto incisore," &c. anno 1730, printed on folio paper, but of different sizes and shapes. They are feeble in chiaro-scuro, and though not entirely tasteless, display no great knowledge of the art of engraving.

Antonio Maria Zanetti was of a noble Venetian family, born in the year 1680, and died in his native city in 1757, according to Huber; but according to Strutt, he lived ten

years longer. He acquired what is often termed a competent knowledge of drawing, at a very early age; and before he was fifteen, engraved some figures and some heads, which he dedicated to Dr. Mead, the celebrated English physician.

The works of Zanetti consist of etchings and engravings in chiaro-scuro; and, in the estimation of our countryman Strutt, they "prove him to have been a man of great genius and sound judgment."

Assisted by his relation A. M. Zanetti the Younger, and other artists, he engraved and published a large number of prints, taken from the drawings of Parmegiano, Raphael, and other great painters, which he purchased at the sale of the Arundelian Collection. They are divided into two sets; and both together consist of eighty-nine prints on copper and wood, with the portrait of Zanetti, engraved by Faldoni, from a painting by Rosalba."

We come now to what must be a reproach either on his "genius," or his "judgment," or on both. Strutt adds, that "in order to render this collection the more valuable, he burnt the wooden blocks from which the chiaro-scuros were printed, and destroyed the copper-plates, after he had taken off such a number of impressions as he thought proper, which, we are informed, was by no means very large."

Now no principled engraver desires that his works should ever become rare from any other cause than the extensive demand for them among the public; and the substitution of nominal for intrinsic value, is an expedient worthy only of traffickers in art, and which "great genius" and "sound judgment" would equally disclaim.

Zanetti resided for some time in London, and engraved here a set of twelve studies of heads, figures, &c. from his own drawings, which he tinted in a spirited style, and which, according to Strutt, do him great honour.

He also engraved in aquafortis another set of twelve plates, of which the subjects are animals and figures, after Castiglione; a set of the statues which adorn the library and palace of St. Mark at Venice; and a set consisting of eighty plates of the engraved gems of antiquity. His cypher will be found in Plate III. of the monograms of the *Italian Engravers*.

Zanetti the Younger was nephew to him of whom we have just closed the account, and was born at Venice A.D. 1720; but the year of his demise has not been mentioned. He engraved in the taste and style of his uncle, whom he assisted in his work after the statues at the palace of St. Mark, as well as in that after the drawings by Raphael, &c. which once formed part of the Arundelian Collection. And in the year 1760 he published an excellent work, adorned with eighty plates, engraved by himself, and intitled "Varie Pittore a fresco de principali Maestri Veneziani," &c.

Francesco Fontibasso was born at Venice A.D. 1681. He learned drawing in the Roman academy, and studied for a time under Seb. Ricci, whose style of painting he imitated with no inconsiderable degree of success, in the pictures which he painted for the Duodo palace, and the church of St. Salvador. In the year 1709 he travelled to Petersburg, with the view of bettering his fortune, where presumptively he died, for we do not hear of his return.

He etched several plates with mediocre, but painter-like ability, among which are a set of seven whimsical subjects from his own compositions, in small folio; and "The Holy Virgin appearing to St. Gregory at prayer," an upright of the middle size, from Seb. Ricci.

Carlo Carloni, or Carlone, was born at the village of Scaria, in the Milanese territory, A.D. 1686, and died at
his

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his native place in the year 1775. He was of a numerous family, of whom the greater part were artists. His father was a sculptor, and intended Carlo for that profession; but finding he had more inclination to become a painter, placed him under Julio Qualio, under whose instruction he soon became remarkable for talent and industry, and occasionally both painted and engraved. In his pictures he produced a rich and agreeable effect, and made some advances toward combining the merits of the Roman and Venetian schools. Of his engravings, of which we cannot say quite so much, the following are held in most esteem: "A Holy Family, wherein St. John is kissing the Feet of the Infant Saviour;" and "The Miraculous Conception," both of 4to. size; "St. Charles Borromeus administering to the Sick, during the Plague at Milan," in folio; three plates of ceilings, in 4to., in one of which is a group of children with flowers; and the death of a faint, of folio dimensions.

Andrea Zucchi was born at Venice in the year 1680, where he engraved a set of twelve plates of Venetian habits, and many other subjects for the libraries. In 1726, he was invited to Dresden to paint theatrical scenes and decorations; and on his return to his native city he engraved most of the plates for the collection published by Lovisa, consisting in the whole of fifty-seven plates, from the most celebrated pictures at Venice; but his talents as an engraver never rose above mediocrity. Among his best productions are, "The Angel Raphael conducting the young Tobias," in large folio, from Titian; "St. John the Evangelist," of the same size, from the same painter; "St. Barnabas Vescova, St. Peter, St. John, and other Saints," from the picture which D. Varotari painted for the church of St. Barnabas; "St. John the Baptist," from P. Veronese; "The Martyrdom of Paul Erizzo," from P. Longho; "The Nativity of the Virgin," from a picture by Nic. Bambini; "Manna gathered in the Desert," from Joseph Porta, a circular print; "Cybele on her Car drawn by Lions," from a fresco by Tintoret; and "Eneas saving his Father and Son from the Conflagration of Troy," after Seb. Ricci; all of large folio dimensions.

Francesco Zucchi was the younger brother of Andrea, under whose instruction he studied the elements of art. In the year 1750, he was invited to Dresden to paint for the electoral gallery, but was interrupted by the war, which obliged him to return to his native country, where he worked chiefly for the bookfellers. He engraved several of the plates from the pictures in the Dresden gallery; among which the following will probably be found on the whole to deserve a preference; the portrait of Espagnol, from Rubens; ditto of a woman who resembles the first wife of Rubens, both in folio; ditto of Jacques Antonio Murani, from Jean da Antoua, in an oval of folio size; "St. Helena worshipping the Cross," from Bettini Cignarolli, in folio; "The Martyrdom of Religion," an allegorical subject, in folio; "Religion and the Sciences contemplating the Portrait of a Cardinal," in folio; and "Apollo with his Lyre," surrounded with ornaments, of large quarto size.

Lorenzo Zucchi was the son of Andrea, and was born at Venice in 1704. When his father was invited to Dresden, in the year 1726, Lorenzo accompanied him, and having been instructed in the elements of engraving, he continued to practise it in that metropolis with success, and was honoured with the title of engraver to the court of Dresden. Most of his productions are from the Dresden gallery, and among them the following have been thought the most worthy of notice.

Portraits.—Herman Charles Keyserling, count of the holy Roman empire, from Anna Maria Werner, in large

folio; John Frederick, prince of Sapieha; Bonaventura Rossi, painter to Augustus III.; Louis de Silvestre, first painter to Augustus III.; L'Abbate Pietro Metastasio, Poeta, &c. all of large folio size.

Various Subjects from the Dresden Gallery.—"The seven Sacraments," from Joseph M. Crespi; "The Martyrdom of St. Peter and St. Paul," from Nic. del Abbate; (P. Tangi likewise engraved this picture, which engraving, as well as that of Zucchi, will be found in the collection from this gallery;) "St. Catherine receiving the Crown of Immortality," after a copy by Erasmus Quellinus, from Rubens; "A grand Sacrifice to Venus," from G. Lairelle; "The Supplication of Marfyas," from J. B. Langetti, all of large folio size; and "The Archangel Michael precipitating the Dragon," from Steff. Torrelli; "St. Joseph, with the Infant Christ in his Arms," from Jos. Angelli, in the gallery of the count de Brühl; two landscapes, entitled "Soggiorno pastorale, and "Campagne aperta," from Jos. Roos; "The last of the Cæsars," two half figures, one of which represents Titian, marked Tizianus f. L. Zucchi delin. et sculp. engraved in the style of Pitteri; and "David with the Head of Goliath," from L. Jordane, all of folio dimensions.

Jerome Ferroni was born at Milan in the year 1687. He painted the death of St. Joseph, for the church of St. Esutorio, and afterwards travelled to Rome, where he worked some time in the school of Carlo Maratti, after whose pictures he etched the following subjects, in the slight spirited style of a painter, but with great taste; "The Sun standing still at the Command of Joshua;" "Deborah singing the celebrated Canticle, after the Victory over Sisera," and "The Death of Sisera," all in large folio; "The Chastity of Joseph," in quarto; and "Judith beheading Holofernes," in folio.

Giovanni Antonio Faldoni, was born at Ascolo in the year 1690. He learned painting under Antonio Luciani, and likewise practised engraving. Faldoni worked chiefly, if not entirely, with the graver, frequently imitating the style of Mellan with no inconsiderable degree of success; on the whole, he merits the encomium of having been an artist of ability. His best prints are the portraits of the doges of Venice, the procurators of St. Mark; various antique statues, making part of two volumes in folio, of Venetian antiques; part of the designs of Parmegiano, for the collection in two folio volumes published by Zanetti; a portrait of Antonio Maria Zanetti, from Rosalba, in folio; Marco Ricci, from Rosalba, in folio; "Sebastianus Ricci Bellunensis Picior, sue ætatis facili primus, annum ægens LX." in folio; "A Holy Family in a Landscape, with Angels ministering," from S. Ricci, in large folio; "The Conception of the Virgin," from the same master; "The Nativity of our Saviour," from P. de Cortona; "David playing the Harp before Saul," from Jos. Camerata the elder; "David flying from the Anger of Saul," from the same master, all of folio size.

Antonio Baldi was a native of Cava, in the kingdom of Naples, and was born in the year 1692. He studied the rudiments of painting under Solimene; and learned engraving of Magliar. He established himself as an engraver at Naples, and engraved for the most part after Solimene, but occasionally from his own compositions. The following are some of his best engravings; the portraits of the emperor Charles VI. in an oval of folio size; Don Carlos, king of the Two Sicilies, of the same size and form; Nicholas Cyrilus, a physician; Maria Aurelia Carraccioli, a nun; St. Ignatius of Loyola, in an oval, with accessories; and Raphael Manea, accompanied by an angel, also in an oval; "The Communion of St. Mary the Egyptian," inscribed

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"*Dive Maria*;" "*St. Philip of Neri, in Heaven before the Trinity*," inscribed "*Cui nomen dedit alma Trias*;" "*St. Emigde, interceding for the Neapolitans*," inscribed "*Divo Emigdo in terræ motum, et Neopolis Patrono*;" and "*St. Gregory the Martyr, with the Subjects of his Miracles*," all of folio dimensions.

Andrea Magliar was born at Naples in the year 1692. He engraved from the pictures of Solimene and other masters, but is very little known, and we are not able to specify any of his works. His son, Gioseffo Magliar, was the disciple of his father and of Solimene; and great expectations were formed, from the early specimens which he gave of his abilities, but he died young. There is a print by him, of "*Christ appearing to St. William*," of folio size, from Solimene, which certainly is a work of considerable promise.

Giovanni Domenico Campiglia, was born at Luques in the year 1692. At Florence he became the pupil of Thomaso Redi, and Lorenzo del Moro; and at Bologna he studied in the school of Gioseffo del Sole. He drew most of the statues, busts, and portraits of the Florentine gallery; and composed the typographical ornaments for that work. Campiglia was invited to Rome, where he did the drawings of the sculptures of the Capitol, the first volume of which appeared in 1741. He has etched a great number of plates, with some taste, and among them the following portraits; Giovanni Lorenzo Bernini, Julio Romano, Salvator Rosa, Leonardo da Vinci, and Giovanni Antonio Razzi; all of folio dimensions.

Giovanni Batista Tiepolo, was born at Venice in the year 1697, and died at Madrid A.D. 1770. In his youth he frequented the school of Gregory Lazarini, and after having worked at Milan, and in other parts of Italy, he travelled to Germany, and painted, in the episcopal palace of Wurzburg, the hall, the staircase, and two altar pieces. He afterwards went to Spain, and painted in conjunction with Mengs, who became jealous of him; but for the detail of his merits in this art, see the article *TIEPOLO*.

Tiepolo engraved fifty-six subjects in a very superior style, exceedingly neat, and with taste, correctness, and spirit, from which the following are selected. "*The Adoration of the Kings*," in folio, from his own composition, which is generally regarded as his *chef-d'œuvre*. A set of fancy subjects, consisting of twenty-four plates, in quarto. And another set of fancy subjects, in ten plates, smaller than the foregoing. All from his own compositions.

Giovanni Domenico Tiepolo was the son of the preceding artist, and was born at Venice A.D. 1726. He learned the principles of drawing and painting of his father, and in 1745, painted the figures of the cupola of the church of St. Faulin, and St. Jovita at Bressle.

He also occasionally took up the etching point as his father had done, working sometimes in a style which bears resemblance to the etchings of Calliglione, and on other occasions in that of his father. His best prints are, a set of twenty-seven small plates, lengthways, representing, in series, "*The Flight of the Holy Family into Egypt*;" a set of twenty-six heads, of the same size, executed in the style of Calliglione; "*The Way to the Cross, or the History of the Crucifixion of our Saviour*," in fourteen plates of quarto size; "*The Miracle of St. Francis*;" "*The Miracle of St. Jerome*," both in quarto; "*The Republic of Venice receiving the Riches of Neptune*," an allegory, in folio; "*The Virgin in the Clouds appearing to St. Theresa*, and two other female Saints;" and "*St. Ambrose preaching to the People*," both in large folio. The whole after the designs of the elder Tiepolo.

Lorenzo Tiepolo, brother to the above-mentioned artist, was also a painter, and etched in a style, and with a degree of taste which appears hereditary, from the designs of his father.

Giulio Giampiccoli, or Jampiccoli, was born at Venice A.D. 1700. We are ignorant under what master he learned engraving, but his style greatly resembles that of the school of Wagner. He mingled etching with the work of the graver, and engraved both history and landscape with success; the following few may be reckoned among his best productions. A set of thirteen landscapes, from Marco Ricci, in large folio. A set of pastoral subjects in four plates, each being inscribed with six Italian verses; and four landscapes after Marco Ricci, and F. Zuccarelli, in large folio.

Francisco Polanzani, or Polanfani, was born at Andale, near Venice, A.D. 1700, and resided at Rome. The most considerable work we have by him, is a set of twenty-two plates, of which the subjects are from the life of the Virgin, either after Poussin, or, more probably, from Jacques Stella (to whom Bassan attributed them). The following may also be reckoned among his best productions. The bust of a female, from C. Cignani. A bust of a blind musician, from Marco Benefiali. "*Mater amabilis*," from Jos. Nogari. Two other subjects from the same master, an old Man with a Bag of Money; and an Old Woman with a Hand Grenade, all of quarto size. And "*An Old Woman warming herself over a Chafing-dish*," from the same painter, in folio.

Giovanni-Batista Pittoni, was born at Vicenza in 1690, and died at Venice A.D. 1767. He was the nephew and disciple of Francisco Pittoni, the Venetian painter, and his historical pictures are held in considerable esteem. There are some few etchings by this painter which are much valued by connoisseurs, and are marked sometimes with his initials, or at others Batista P. V. F. and sometimes with his name at full length, but we are unable to specify any of them.

Antonio Luciani was a native of Venice, and born A.D. 1700. He studied painting under Jacques Piccini, though he is better known as an engraver than as a painter. Luciani engraved from the works of Tiepolo, Cassana, Bombelli, and others, but his works are held in no very high degree of estimation, and it may therefore be sufficient to specify the two following prints by him. The portrait of cardinal Sforza Pellavicini, from Pietro Avogadro; and that of the Jesuit Tambarini, from the same painter, in folio.

Dominico Rossetti was born at Venice in the year 1700. The prelate Giovanni Francesco Barbarigo, being very fond of this artist in his youth, took him to Verona, where he pursued his studies for some time. He practised architecture, as well as engraving both on copper and wood, and when some years had elapsed, and his reputation was established, Rossetti was invited to Dusseldorp, by the elector palatine, to engrave "*The Triumph of Alexander*," from G. Laireffe, on twelve large plates, which is become exceedingly rare, because, before many impressions had been printed, the elector had the plates gilt. This artist also engraved several of the plates for the collection of prints taken from the most capital pictures at Venice, which was published by Domenico Lovisa, and among which the following will probably be found most worthy of the notice of the connoisseur.

"*Pope Alexander III. recognized by the Doge of Venice*," after Paolo Veronese; "*The Ambassadors sent by the Venetian Senate to the Emperor Frederic Barbaroussa*," after the pictures of Carlö and Gabriel Cagliari, which are preserved in the hall of the grand council chamber at Venice.

Another

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Another print, of which the subject is taken from the same embassy, after Tintoret, whose picture is also preserved in the same public hall; "The great Victory gained by the Venetians over the Imperialists," from the same master; "The Pope bestowing his Benediction on the Doge Zanii, previous to his Battle with Barbaroussa," after Francesco Bassano; "The Emperor Barbaroussa prostrate before Pope Gregory VIII.," after Frederico Zuccherò, and another with the Italian title "Othone vien licenziato dal Pontefice e dal Doge perche vada al trattar la pace con l'Imperadose suo Padre," also after Zuccherò.

The portrait of Thomaso Sennachio, (a celebrated physician,) after S. Bombelli, is also engraved by Rossetti; and all the above are of large folio dimensions.

The names of some few of the engravers of Italy, who run their obscure and uninteresting careers about this period, have been purposely omitted, as being altogether unworthy of our records. Indeed, when we reflect on the advantages possessed by the artists of Italy, compared with those whose inferior fortune it is to exist in the other countries of Europe, we cannot but feel some surprize that in the course of the century through which we have just laboured with due obedience to chronologic order, so few engravers who are justly entitled to rank high in their profession, should have appeared in that highly favoured country. While France, Germany, and the Low Countries, with inferior opportunities, present a respectable display of talent in this art, and are even brightened with some rays of original genius, the history of Italian engraving is little better than a dull record of creeping mediocrity.

If the reader participates in our surprize, he will perhaps be led to reflect whether this effect may, with more justice, be ascribed to dearth of that particular kind of genius combined with patient assiduity which is required to excel in this art? or to paucity of Italian patronage? or that no philosophical view was then and there taken of the principles and practical energies of engraving, though painting and the art of the statuary were abundantly honoured with the literary attentions of their Italian professors and critics? or lastly, how far it was owing to the circumstance of engraving being less studied and practised in Italy, as a distinct profession from that of painting, than in the north of Europe?

The name and the works of Piranesi, which we now approach with all the refreshing pleasure with which wearied attention is inspired by the appearance of a worthy object, may shed some salutary light on the discussion of these questions, or will at least prove that the genius of Italian engraving had not fled for ever to less genial climates.

Giovanni Battista Piranesi, was born in the Roman territory early in the eighteenth century; Huber says in the year 1707, and died in the city of Rome in 1778. He was at once architect, antiquary, draughtsman, and engraver, and in all, but more particularly in the latter art, evinced the most vigorous and original powers. He appears to have had no tutor, at least none has been mentioned by his biographers, and excepting a sound mathematical foundation, with which books or a master must presumptively have supplied him, he built his style of engraving on his own strong and keen observation of nature. In his practical knowledge of perspective, as in his treatment of ruined edifices, he had no predecessor, and though he will always have numerous imitators, he has yet met with no rival in Italy, nor even in Europe, save and except our own Edward Rooker, and another, whom, with still more propriety, *we Cyclopedians* may call our own.

The authors of the French Encyclopedie say of Piranesi, that he was the best draughtsman of ruins, and the most pic-

turesque engraver that the country produced. 'This is no cold praise, though not warm enough for the ardour of the subject. His professional industry was unremitting, yet his mind and his hand have so far outstripped time, that though we know this, we remain in astonishment at the vast quantity of his works, which, when their number and magnitude are taken together, exceed the productions of any other engraver whatever. A pile of more than twenty large folio volumes, replete with taste and intelligence, seems too much to have been produced by the labour of a single individual, even after we have made ourselves acquainted with the rapidity of his powers; yet all these are etched from drawings made by himself, and some of these drawings, of which the subjects are the Greek temples at Paestum, and which attest the vivid feeling and masterly powers of execution which Piranesi possessed in that branch of the art, are now in this country, having been purchased within these few years in Italy, by Charles Lambert, esq. of the Inner Temple.

Towards the middle period of his life, or rather before, our engraver became a member of the Roman academy of arts, but on account of some feuds, with the merits of which, if any merit attached to them, we are not acquainted, he was expelled by the voice of the majority of academicians. After some few years, however, had elapsed, and animosity was cool, motives were explained, or mistakes were discovered, and Piranesi was honourably invited by his brother artists to return. He was, about the same time, perhaps to give the greater eclat to his return, created a Roman knight, but was always better known by his name than his title.

Of many irrefragable proofs that might be adduced to render idle the sophisms of those who assert that engraving is not an *original* art, Piranesi is one, having never, to the best of the present writer's knowledge, engraved after any other pictures or drawings than were the production of his own hand, which sometimes present us with the magnificent remains of ancient Italy, and are sometimes the ready offspring of a mind stored with architectural wonders.

Wherefore, unless those arts which are capable of independent existence, might justly lose their claim to originality, by condescending to copy, where the general and inseparable interests of art and society require such condescension, no man, and no privileged body of men, should say of engraving that "it is not an original art," for no man of sense denies originality to a picture, because a sketch or cartoon of the same subject has previously existed, nor to the art of the sculptor, because he models in clay before he chisels in marble.

Though the human figures which he introduced into his landscapes, are extravagant in their attitudes, and ill drawn, they act the parts which they were intended to act; they serve to shew that the scenes he has represented were inhabited (if not by whom), and they are a scale whereby he induces the spectator unwittingly to measure the relative magnitude of those edifices which were the real and the ostensible objects of his art. In his characteristic treatment of those edifices, and of the vases and other ornamental remains of antiquity, his line, varying as occasion admitted or required, was peculiarly expressive of stone, bronze, stucco, brick, and all the various materials of which Greek and Roman sculpture and architecture consist, discriminating with exquisite observation and inimitable skill, whether those materials retained their original sharpness of workmanship, or were mouldered by the hand of Time; or stained by weather; or split and cracked by the frost, by Vandal barbarity, or other sudden casualty; and whatever his subject, he always seems to have worked with easy vigour, with un-

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limited freedom of hand, and as if "out of the abundance of his heart."

Trees do not often occur in the prints of Piranesi, but when they do, they in most instances too much resemble seaweed: yet the wild raggedness and unexpected forms which characterize both these and the clouds which float over his landscapes—and even his ill-drawn figures—have a certain air of enterprize, which accords with the forceful and chivalrous character of his *chiaroscuro*, and rather augments than diminishes, the general sentiment of romantic magnificence, which many of his compositions, and more especially the large frontispieces which fold into his large folios, inspire.

In some of the latter, all the grand architectural forms of Egypt, Greece, and Italy, appear to be assembled, as if by magic, and the mind of the spectator is led to wander, in poetic reverie, through irregular avenues of obelisks, farocephagi, pyramids, columns, and triumphal arches. In others, which are of subterraneous character, the author appears to have penetrated the cemeteries of departed greatness, and here, monstrous and forbidden things, are crawling and twining their slimy convolutions among mouldering bones, broken sculpture, and mutilated inscriptions, and an air of dankness and dilapidation, and sepulchral gloom, is diffused through the cavern, as if Time and Envy were beckoning to Oblivion, to break down what remained of the trophies of the brave, and obliterate the wisdom of the wise.

In his technical process, Piranesi was the first engraver who made free and abundant use of the ruler, as may be seen in his interiors of St. Peter's cathedral, his antique vases, and such other subjects as required it, or as admitted it only in certain parts; for he sometimes artfully contrasted, in the same plate, the wildest sallies of the etching-point, in the broken or weather-stained parts of his lights, with ruled passages in his shadows, where the utmost regularity and perspicuity were preserved. Thought always accompanies his deeds, even where he seems most careless. The reflex lights of a bright climate might seem, to the inconsiderate in a humid one, to partake of flimsy transparency. In the works of Piranesi, they shew the justness of his observation. If he was stimulated by an adventurous spirit, he was restrained by judicious caution, which sat so easy on him, that he exerted it without the least seeming effort. In short, with the skill and conduct of a brave general, it was his to vary and adapt his mode of execution, and qualify his powers, by the nature of the occasion which called it forth: he used the graver with boldness when he did use it, but used it only as an auxiliary to his etching. He knew that this was the main body of his native force, on which he could most depend. He doubtless felt that he was here the Alexander of his art, and that none could here, with any hope of success, dispute with him for the palm of victory.

To speak of the works of this artist in detail, would fill a volume: it must therefore here suffice to say, that among the best of them will be found the frontispieces or title pages to his large volumes of Italian antiquities, consisting, for the most part, of very rich compositions, formed of the fragments and monuments of antiquity. Several views of the Coliseum and arches of Constantine and Septimius Severus, at Rome; the pyramid of Cestius, with other Roman antiquities; the tomb of Cecilia Metella, on the Appian way; the fountain of Bernini, with the surrounding edifices; the façade of the Basilicum of St. Mary, with other buildings; ditto of St. Lorenzo on the Tiburtinian way; (an admirable mixture of regular with irregular mode of execution, in the treatment of the architecture;) interior and exterior views of the Pantheon of Agrippa; a very large and mag-

nificent view of the Sybil's temple at Tivoli; another view of the same temple, somewhat smaller; another, with the cascade at Tivoli; the bridge and castle of St. Angelo; the Ponte Mola; the square of the Capitol; the square of Monte Cavallo; the grand fountain of Trevi, and the temple of Jupiter Tonans; all of large folio dimensions, and some of them so large as to fold into his imperial folios.

Francisco Piranesi was the son of Giovanni Battista, and was born at Rome in the year 1748. He became an engraver of landscape and ruined buildings, in which he imitated the style of his father, but, like other followers, was always behind, though his engravings of this kind possess so much merit, that were his father's works annihilated, he would be entitled to hold rather an high rank in his profession. Francisco did not, however, confine the exercise of his talents to landscape and architecture, but engraved several plates of the celebrated statues of antiquity. He drew the human figure better than his father, but in his treatment of the antique was still an imitator, following, with much devotion, the style of engraving of Pitteri, of whom we shall presently speak.

Among the best of his prints are views of the Coliseum, the Pantheon, the baths of Sallust, the baths of Dioclesian, and the temple of Isis at Pompeia, all in large folio; and in very large folio, the illumination of the chapel of Paulina, in St. Peter's cathedral; and among his statues the following are entitled to respectful notice, *viz.* the sitting Jupiter of the Museum Clementinum, the Venus de Medicis, the group of Cupid and Psyche, from the gallery of the Capitol, and Orestes recognized by Electra, mistakenly called by some the young Papirius and his mother, from the original sculpture in the Villa Ludovica, all of large folio dimensions.

Laura Piranesi, was the sister of the preceding artist, with whom she equally distinguished herself by engraving: the following views are by her hand, *viz.* the Capitol of Rome, the bridge of Salario, the temple of Peace, and the arch of Septimius Severus, all of 4to. size.

Giovanni-Marco Pitteri, was born at Venice A. D. 1703, and died in the same city in 1767. He studied engraving for a short time under Jos. Baroni, whom he soon quitted for J. A. Faldoni. The works of this admirable artist are executed in a very remarkable style, with single courses of lines, though very differently disposed from those of Mellan and his followers. They run perpendicularly from the top to the bottom of the plate, and the shadows are expressed by strengthening them as occasion required. The effect he has produced in this new mode of engraving is far more pleasing and harmonious than could have been expected, especially where, by partially notching his lines, he has imparted stony character and richness, to such parts of his prints as required it. This artist, being always occupied with engraving, never travelled out of his native place.

Among his works, the following are most worthy of notice.

Whole-length Portraits and Heads, all in large Folio.—A bust of himself, from Piazzetta; a bust of J. B. Piazzetta, a Venetian painter; Charles Goldini, a Venetian comic poet; John Mocenigo, a Venetian nobleman; Joseph Nogari, a Venetian painter, with his hand on the hilt of his sword; and a young lady resting her head on her hand, all from the same painter; count de Schulenburg, field-marshal of the republic of Venice, from C. F. Rufca; cardinal Quirini, marquis Scipio Maffei, Clara Isabella Fornari; and a set of heads on sixteen plates, which are presumptuously entitled God the eternal Father! our Saviour, the Virgin Mary, the twelve apostles, and St. Paul, all from Piazzetta,

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Piazzetta, according to Huber, but, according to Strutt, the latter are from his own designs.

Various Historical Subjects.—"Christ expiring on the Cross," with the effect of night; "Religion and Heresy," an allegory, both from Piazzetta; "A Holy Family," from Pietro Longhi, in large folio; seven folio upright plates of the sacraments; six large folio plates representing chaees in the neighbourhood of Venice, from the same master; "St. Peter delivered from Prison by an Angel," after Espagnoletto; "The Martyrdom of St. Bartholomew," from the same master, both in folio, for the Dresden gallery; "St. Catherine of Sienna," after J. B. Tiepolo; "The Penitent Magdalen," from the same, for the Dresden gallery; "The drunken King," after D. Teniers; and two rustic subjects, after the same painter, (the Shoe-maker, inscribed "Ne futor ultra crepidam," and the Miller, inscribed "Sudat rotator sua forte contentus,") all in large folio.

Comte Pietro de Rotari was born of a noble family at Verona in the year 1707, and having a natural turn for the fine arts, together with the means of indulging it, became successively the pupil of Robert van Audenarde and Antonio Balestra. He studied with commendable assiduity, and travelled in quest of improvement, or of distinction as an artist, to Venice and to Rome, and afterwards to Vienna, Dresden, and Petersburg, in the latter of which cities, after a residence of eight years, he ended his career in 1764.

His engravings consist of slight, spirited, painter-like etchings, which are much sought after by the curious, and are executed from his own compositions, or from those of his master, Balestra. From among these, the following will probably be found most worthy of selection. The portrait of Filippo Baldinucci writing; "St. Francis adoring the Crucifix," a middle-sized upright oval, from his own composition; "The Education of the Holy Virgin," of the same size; the head of an old man with a beard. Another head of an old man looking upwards, both in 8vo.; "The Three Angels entertained by Abraham;" "David with the Head of Goliath;" "St. Jerome;" and "The Interview between Venus and Eneas," all of 4to. size; and, of somewhat larger dimensions, three monks of the order of St. Francis, after Balestra. The count also arrived at some eminence as a painter of portraits and history.

David Antonio Fossato was born at Moreo, a bailiwick of Luggeris, in Switzerland, in the year 1708; but resided at Venice with an uncle, who was a merchant, and wished Fossato to become one also, but finding he had more taste for the arts, he gave up this design, and placed him under Vincent Mariotti, a good designer of architecture, and a master in perspective, with whom he made great progress. He afterwards travelled to Vienna with Daniel Gran, under whom he executed some very fine pictures, particularly a very superb ceiling for the Imperial library. He worked with great success, both in oil and fresco, in most of the towns of Rome and Germany; and likewise amused himself with the point. Among his best productions in that way, the following may be reckoned. A set of twenty-four folio landscapes of Venice and its environs, from M. Ricci, with a dedication to count Algarotti; "Diana and Callisto," from Solimene; "The Family of Darius before Alexander," from P. Veronese; "Jupiter thundering against the Vices," from the ceiling of the council-chamber; "The Servant of Abraham with Rebecca," half figures, from Ant. Bellucci; and "The Vocation of St. Peter to the Apostolate," from the same painter, all of folio dimensions.

George Fossato was born A. D. 1710, and was probably of the same family with the preceding artist. We are igno-

rant of whom he was the pupil; but he worked some time at Milan, and from thence went to Venice, where he settled.

He etched the edifices which the celebrated architect Palladio erected at Padua, Vicenza, and other towns and cities of Italy, which was published by Pasinelli at Venice, during the years 1740 and 1745, in French and Italian, of large folio size. The etchings are well executed, and do honour to the taste and intelligence of our artist.

Jacques Leonardis was born at Parma A. D. 1712. He learned the rudiments of art of M. Benville, (a portrait painter,) and J. B. Tiepolo. He engraved from the most celebrated pictures in Venice, and, with commendable regard to the public deficiencies, commonly made choice of those which had not already been engraved; though he generally succeeded so well in copying the characters and effects of his originals, that he need not to have been either afraid or ashamed of following other engravers, by working after the same pictures. The best of his productions are, "Cupids playing," after Julio Carpioni; "The Rejoicing of Silenus," from the same painter; "Neptune in a Car drawn by Tritons," from Seb. Conca; "The Rape of Europa," from the same master; two rustic subjects, one representing "A Village Fair;" and the other "A Crowd of Beggars at the Gate of a Town," from J. M. Crespi; two comic subjects representing "The Diversions of the Carnival at Venice," from Tiepolo; "The Golden Calf," from Tintoret; and "The Last Judgment," from the same master, all of large folio size.

Michael Sorello was born in Spain, but in what year is uncertain. He settled at Rome A. D. 1750, and studied engraving under Giacomo Frey, (for an account of whom see *GERMAN School of Engraving*.) and worked very much in the style of that very distinguished master. The most considerable work we have by Sorello is a set of eight prints, engraved from the tapestry of the Vatican, after Raphael; he likewise engraved, after other Italian masters, several meritorious plates for the Museum Florentinum. From the mass of his works, the collector may, with advantage, select good impressions of the following, for his Italian portfolio:—"The Nativity," where a shepherd, accompanied by his dog, is among the principal figures, from Corri; "The Purification of the Virgin;" and "St. Peter proclaimed Chief of the Church," from Carlo Maratti, all in large folio; and "The Descent of Christ into Hell," in small folio; "The Resurrection," dedicated to Antonio Colona; "The Disciples at Emaus," in large folio; "Christ represented as a Gardener," or, the "Noli me Tangere;" "The Conversion of St. Paul," from C. Maratti; the frontispiece for the *Monologium Græcorum*, after Seb. Conca; and an "Annunciation of the blessed Virgin," from Felipe de Castro, (a Spanish painter,) both in large folio.

Paul Pilaja, or Pilaia, was a native of Italy, and appears to have been born about the year 1718. The circumstances of his life have not been recorded, but he seems to have worked at Rome. He engraved the prints for a book entitled "Storia di Volsena," by the Abbé Adami, with the portrait of the author, after the Cavalier Odam; which book, according to Gandellini, was printed at Rome in the year 1737. He also engraved, in folio, the statue of the prophet Elias, from Aug. Cornacchini, erected at St. Peter's cathedral; the portrait of pope Benedict XIII. from J. B. Brughi, a Roman painter; "The Martyrdom of the Capuchin St. Fedele da Simaranga," from Seb. Conca, both of folio size; "The Miracle performed by St. Thoribio, archbishop of Lima, while preaching to the Indians,"

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Indians," in large folio; "Liberality" with two children, in folio; and "Clodius, disguised as a Woman, discovered at the House of Cæsar," both from the same master, in large folio.

Niccolo and Antonio Billi were brothers, and born at Rome some time about the year 1719, or 1720. Of the family of this name, which were long known at Rome, as printfellers, and some of whom were engravers also, we shall mention only these brothers, who engraved many portraits and devotional subjects at Rome, and various plates for the volumes of the antiquities of Herculaneum, at Naples, executed in a stiff style, without much taste. Niccolo engraved many of the plates for the Museum Florentinum, and among his productions are also the portraits of Fredericus Zuchiarus, drawn by Campiglia; John Holbein, "se ipse pinxit." Pietro Leonardo Ghezzi; John Maria Morandi; the cardinal Pompeo Aldrovandini, all in folio; the cardinal Joseph Spinelli Dom. Dupræ pinx.; "The Infant Jesus," in an oval, of 4to. size, from J. Conca; "St. Philip of Neri, kneeling before the Virgin," from S. Conca; "A Holy Family," half figures, from Caracci, in 4to; and "The Flight into Egypt," from Guido, in large folio.

Carlo Gregorio, or Gregori, was born at Florence in 1719, and died in the same city A.D. 1759. He learned engraving at Rome under the direction of Giacomo Frey, and worked for the greatest part of his life in his birth-place, after the celebrated painters of Florence. Part of the plates from the cabinet of the marquis Gerini, and some of those in the Museo Fiorentino, are by him, of which collections they constitute the best and greatest part. Among his productions the following may also be mentioned with approbation, viz. the portraits of Francisco Maria, grand duke of Tuscany, from Campiglia; his duchess, Eleonora Vincentina of Gonzague, from the same painter; and Sebastian Bombelli, painted by himself, all in folio; the statue of the Virgin, brought to Bologna by angels, from a design by dal Fratta; St. Catherine Jannen, from F. Bartolozzi, all of folio size; "L'Istoria di Cefare, a cui nell'Egitto molte Nazioni presentarono vari donativi—Soldano d'Egitto," from Alexander Allovi, detto il Crupino; "Opus Bernardini Barbatello, detto Poccetti, quod in facello S. S. Nerei & Achillei in Atrio Templi S. Magdalene de Pazzis Florentia adfervatur;" fourteen subjects from the Lives of the Saints, at the church of St. Magdalen at Florence; these were engraved in conjunction with his son Ferdinand, in large folio; "The Virgin and other holy Women at the Sepulchre," from a picture by Raphael, in the cabinet of lord Scarfdale, in folio; St. Padio, a bishop of Florence, from Sig. Betti, in 4to; St. Bonizella Cacciocanti, a half figure, from Ant. Bonfigli, in 4to.; and the mausoleum of the princess Elizabeth Charlotte of Lorraine, from Jos. Chamant, in folio.

Ferdinand Gregori was the son of Carlo, and born in the same city A.D. 1740. He learned the principles of drawing and engraving in his father's house, after whose death he travelled with Vincent Vangelisti to Paris, to finish his studies under Wille. He afterwards returned to his native country, and published several meritorious works, among which were a print of "The Death of St. Louis Gonzaga," after a design by J. B. Cipriani; and a portrait of Carlo Gregori, drawn and engraved by Ferdinand; "The Virgin suckling the Infant Jesus," from Carlo Maratti, in folio; "A sleeping Venus," from Guido, in large folio; "St. Sebastian fastened to a Tree," a half figure, from the same painter; "Venus discovering Cupid mounted on a Dolphin," from J. Casanova, both in folio; two marble groups from Cellini, a Florentine sculptor, after

the designs of Alleananti, in large folio; "A Holy Family," from a painting in fresco, by Andrea del Sarto, in small folio, with a very good effect; and "St. Stephen stoned," from Louis Cardi, (whose picture has a grand character, which is very well preserved in the engraving,) of folio size.

Antonio Joseph Barbazza, was born at Rome A.D. 1720. The life and works of this artist are very obscure, and we can only specify, that he was a member of the Bolognese Academy, and travelled to Spain in 1771. His pictures are less numerous than either his drawings or engravings, which are much esteemed by connoisseurs. Among his prints, four large heads from nature, in the style of pen and ink drawings, are justly intitled to high praise for their truth and originality; a group of musicians, among whom is a caricature of M. Perez, of musical celebrity, in 4to.; the plates for the book of father Bianchini, intitled "Istoria Ecclesiastica," in 4to.; and some plates for the work of Monaldini, who published new editions of Virgil, and other of the classic authors of antiquity.

Jean Elias Morghen was a native of Germany. He was born in the year 1712, travelled to Italy in his youth, and remained there during the greater part of his life, residing for the most part at Florence. He made all the drawings, and engraved most of the plates, for the work which was executed under the patronage of the marquis Gerini, after the pictures of Francechini and other celebrated masters, which decorate the ducal palace of Tuscany. He also engraved and published, in 1767, "The Antiquities of Pæstum," on six plates, after drawings by Antonio Joleg.

Philip Morghen was the son and pupil of Jean Elias, and was born in Italy, probably at Florence, in the year 1740. He went, either for professional improvement or employ, to Naples, where he executed a great number of the plates for the antiquities of Herculaneum, including the portrait of the king of Naples, which serves as a frontispiece to the work.

Philip also engraved a set of twelve folio plates of statues at Florence, called the Apostles of Bandinelli, and thirty-one views of ruined edifices in and about the city of Naples.

His son, or his nephew Raphael Morghen, who has signalized himself by the production of Da Vinci's Last Supper, and other meritorious works, and who still lives and engraves at Florence, will become the worthy theme of future historians of the Italian school of engraving.

Francesco Londonio (whose name and merits appear to have been unaccountably overlooked by our countryman Strutt) was born at Milan A.D. 1723. He began his career in art with the study of historical painting, but soon abandoned the heroism and duplicity of man, for the honesty of the brute creation, and particularly attached himself to the painting and etching of domesticated animals, in both of which arts he was eminently successful.

In the year 1769 he travelled to Rome, Genoa, Naples, and other parts of Italy, and during his stay in the latter city, he made occasional journeys to the surrounding villages, and studied nature with great attention, particularly those rustic and unsophisticated actions and scenes, which were congenial with the simplicity of his own habits and feelings. Here he passed the greater part of his time in etching and engraving, and here, as is believed, he died of an apoplexy in the year 1783.

Londonio engraved a great number of rural and pastoral subjects, consisting for the most part of peafantry and cattle, with the accompaniments of picturesque banks, trees, and water, in a style which, though original, and evidently the offspring of his own observation and feeling, bears strong resemblance to the best etchings of Berghem and Visscher; using

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using the graver and dry-point, with great propriety, only as occasional auxiliaries to his etching-needle.

The works of this artist compose seven sets, consisting in the whole of seventy-two plates, of which the subjects are the rural occupations of Italian peasantry, &c. One of these sets is dedicated to cardinal Pozzobonelli; another to the earl of Exeter, and the rest to different noblemen and gentlemen who had befriended their author, who were most of them Englishmen. Londonio sometimes printed his plates on blue paper, and heightened his lights with white chalk, by which means he produced an agreeable effect.

A picture by this artist, of a Milanese peasant at the entrance of a hut, with goats, is now in the collection of the most noble the marquis of Stafford, at Cleveland house. His pictures are rare, and this is probably the only one in England: it has no very powerful chiaroscuro, but is painted with exquisite feeling, and great dexterity of pencil.

Gioseffo Camerata was born at Venice A. D. 1724. He studied engraving under John Cattini, and travelled to Vienna in 1742, where he learned miniature painting, which he ever after occasionally practised. In the year 1751, he was invited to Dresden, to engrave for the great work from the Electoral gallery in that metropolis, but the war breaking out he returned to Italy. When peace was proclaimed, he once more travelled to Saxony with the electoral prince; soon after which he was elected one of the professors to the Dresden academy.

This laborious artist engraved a great number of plates, many of which were from his own designs; among them are the portraits of Marco Foscari, procurator of St. Mark, and doge of Venice; Simon Cantarini, another procurator of St. Mark, both of folio size; Sebastien Bombelli, in quarto; a whole length of Theresa Zamelli, a celebrated dancer, dressed in the Turkish style; and a large head of Mademoiselle Abuzzi, in folio.

For the *Dresden Gallery*, Camerata engraved two parables from the New Testament, after Feti; "David with the Head and Sword of Goliath," in folio; "A Holy Family," after Julius Cæsar Procaccini; "St. Roche relieving the People afflicted with the Plague," after Camillio Procaccini; "The Charity of St. Roche," after Caracci; "The Assumption of the Virgin," from the same painter, all of large folio size; "The Woman taken in Adultery," after Biscaino, in folio; "The Chastity of Joseph," from S. Cantarini, in folio; and the Old and New Testaments, after And. Vaccari, in large folio. Of his works of subsequent date, the following are to be preferred:—"A Holy Family," after Procaccini, in folio; "The Penitent Magdalen," from a picture by P. Battoni, in the Dresden gallery, in large folio; "A sleeping Shepherd," from J. M. Crespi; "St. George refusing to sacrifice to the Idol," from Count Rotari, both in large folio. Two half length figures with long beards, after Dietrich; and a Magdalen, in miniature; from Vander Werff, of the same size as the original. This was Camerata's last engraving.

Joseph Canale was born at Rome in the year 1728, and became a professor of the academy at Dresden, and honorary member of that of Bologna. He studied engraving under the direction of that justly celebrated master Giacomo Frey, and also frequented the school of Cavalier Benfiali. At Dresden much of his time was taken up in making the drawings from the pictures which were to be engraven both by himself and others, for the publication of "The Dresden Gallery."

Canale had many pupils who did him honour; and his

engravings are very numerous. Among them the following are some of those which are held in most esteem.

Portraits.—Maria-Mattia Perini, a half figure from Marco Benfiali, in quarto; Maria-Antonia Walburgis, electress dowager of Saxony, from a painting by herself in crayons; the archbishop Bonaventura Barberini; Maria Josephini, queen of Poland, after Rotari; the profile of the prince Xavier, after Casanova, all in folio; and the sepulchral monument of cardinal Spinola at Rome, in large folio.

Historical Subjects.—"Imagina miraculosa della S. Virgine Maria trasportata nella Basilica Lateranense," in small folio; "The good Englishman," after Signora Rosalba, from the Crayon cabinet at Dresden, the same size; "The Philosopher," after Espagnolet; "Glory," after Dominichino; "A Sybil," after Angelica Kauffman; "Paris on mount Ida," after Vanloo; "Adam and Eve dismissed from Paradise," after Albanus; "Christ and St. John," after Vander Werff; "Christ appearing to St. Thomas," after Mat. Preti, for the collection from the Dresden gallery. (This plate was only etched by Camerata and finished by Jean Beauvarlet.) "A Turkish Woman," half length, from Dietrich; and "Spring," a half figure, from the same master, of which the last three plates are of folio dimensions.

Bartolomeo Crivellari was born at Venice A. D. 1725. He became the disciple of Wagner, and worked under his direction, from the pictures of Gherardini, Tiarini, Tiepolo, and others, and he likewise engraved some plates for the Institution at Bologna, but attained no very high degree of eminence in his art. Among other engravings by this artist are the following: Portraits of Christian, prince royal, and elector of Saxony; and Mary-Ann, archduchess of Austria, both of folio size. Three subjects from the life of St. Peter of Petronius. Four from Nicolo del Abatte, in folio: viz. 1. A Company of Card Players. 2. A Group of Drinkers, diverting themselves, both half figures. 3. A Company of Musicians. 4. Another Group of Musicians, with a young Female playing the Harpsicord. "The Canonization of St. Alexander Saul," after Matteo Bartoloni; "A young Man and Female seated on a Couch," from Julio Romano, in small folio, from the gallery of the king of Prussia.

Gaetano Gandolfi was a native of Bologna, and the contemporary and fellow student of Crivellari. He engraved, after Nicolo del Abatte, "The Nativity," with "The Adoration of the Shepherds," inscribed "Opus hoc incisumque exposuit," &c. from a picture in fresco, at the palace Leoni at Bologna, in large folio, which latter engraving possesses so much merit as to make us regret that he engraved so little, and that we do not know more of this artist.

Giovanni-Battista Brustoloni or Brustoloni, was born at Venice in the year 1726. He always resided in the place of his birth, and was probably a pupil of Joseph Wagner. We are only able to specify the following engravings by him. The portrait of pope Benoit XIV. in an oval, a vignette with the same portrait; "St. Theresa in Rapture," in folio. A set of twenty views of Venice, etched after Ant. Canale, in folio. Another curious set of twelve large plates, from the same master, represent the ceremonies made use of at the election of the doge of Venice, and at his allegorical marriage with the sea.

Benigne Bossi was born, according to Basan, at Porto d'Arcifato, in the Milanese territory, A. D. 1727. At the age of ten, his father took him to Nuremberg, where he learned the elements of design; and from thence, on the death of his father, he travelled to Rome, and studied under Pompeus Battoni, Hutin, Dietrich, and Mengs. The latter advised him to practise etching, which he did till his death. The seven years' war, of which Saxony was almost

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the continual feat, obliged Bossi to return to Italy, and in 1760 he was received at the court of the duke of Parma, where he lived honorably, occupied with letters and the arts. The following are among the best of his works. A portrait of the engraver Boetius of Dresden; "The Presentation in the Temple," (published at Dresden); a set of heads and other subjects on forty small plates, etched with taste and in a very spirited style; a set of vases, and a masquerade, after Petitot; four subjects of trophies; the Attributes of the Four Seasons, inclosed in circular wreaths; two subjects of children, in small folio; a set of twenty-nine etched, and washed in with water colours to imitate the original drawings by Parmegiano; the cities of Piedmont; allegorical figures for an Epithalamium; and the celebrated St. Catherine, who was related to the house of Sanritali, engraved the size of the picture, and a very capital print.

Antonio Baratti was born at Florence in the year 1727. He worked for the collection of prints after the best pictures in the cabinet of the marquis Gerini, of which Mariette has given a description, and of which the first volume was published in large folio, A. D. 1759, at Florence. He likewise engraved after various Italian masters, and among others the portrait of Jean Bettini Cignarolli, after Della Rosa; of 4to. size.

Pietro Campana was born at Soria A. D. 1727. He learned engraving of Rocho Pozzi, and worked most part of his life at Rome and Naples. We find several of his engravings in the cabinets of Florence and Herculaneum; among which the following are most worthy of distinction: "St. Francis of Paul," a half figure; "Charity," in a small oval; "St. Peter delivered from Prison by an Angel," after Matt. Preti, from the Dresden gallery, in folio; the portrait of Pietro Berretini da Cortona, from the Florentine cabinet; and Bernardino Barbatelli, detto B. Poccetti pittore Ferretti, both in folio.

Carlo Orfolini was born A. D. 1724, in the city of Venice, where he generally resided, and where he carried on a considerable commerce in prints. He engraved for the Florentine Gallery, and among the best of his prints are "St. Jerome meditating," inscribed "post multas lachrymas," &c. from Ant. Balestra, a much admired plate, in large folio. Four others from legendary stories of the saints Aloysius, Stanislaus, Francis, and Bernard, and the High-priest, all of folio dimensions.

Bernardino Belotti, surnamed Il Canaletto, was also born at Venice in the year 1724, and died at Varlovie in 1780. He was called Canaletto from his very distinguished uncle Antonio Canaletti, by whom he was instructed, and whose style he successfully imitated. After visiting Rome and other cities of Italy, he travelled to Germany, where he obtained the title of count Belotti, and made some stay at the courts of Vienna and Dresden.

The subjects of his prints, which consisted for the most part of etching, are landscapes, generally views, (or portraits of celebrated places,) which he treated in a picturesque taste, and which have been held in deserved esteem.

The most remarkable of these are, a set of six views of Vienna, &c. in folio; two other sets, each consisting of six architectural ruins in quarto; and a very large plate, entitled "The generous Turk," the whole of which were executed during his stay at Vienna.

Those which he engraved at Dresden are larger and more numerous. Among these we shall distinguish views of the port Willdruffer Thor, with the ramparts, theatre, and public library; the gallery of Zwinger, with the bridge at the entry of Ostra; interior of the Zwinger, with the pavilions and galleries; the Catholic church with part of the

electoral palace; the bridge over the Elbe, with a profile of the Catholic church; the gallery and gardens of count Brühl; the church of the holy Virgin, &c.; the picture gallery at the above church, &c.; the square before the grand guard-house; the old market at the side of the church of St. Cross; the church and street of St. Cross; the ruins of the belfry of the church of St. Cross, which fell on the 22d of June 1763, at the bombardment of Dresden; the ruins of a part of the suburbs of that city, before the port of Pirna; and two views of the new town and palace of Holland, with the equestrian statue of Augustus II.

Views in the Neighbourhood of Dresden.—The town of Pirna, on the side of the gate called Oberthor; the suburbs of the town of Pirna, before the waterman's gate; Pirna before the gate of Dohna; the façade of the castle of Sonnenstein on the banks of the Elbe, in the back-ground the city of Pirna; the ramparts of Sonnenstein, with the prisons, &c.; the fortrefs of Sonnenstein, from the road to Königsstein; the rock and fortrefs of Königsstein on the south side; the rock and fortrefs of the same city on the western side, with the castle of Lilienstein in view.

Views in Warsaw.—The abode of the Bernardin monks, as it presents itself from the gate of Cracow; Warsaw, from the palace of Sapieha, to the end of Szelle, and from thence to the castle of Villanova, with part of the town of Prague; the city of Warsaw, from the palace of the Ordinate to the royal castle.

Dominico Cunego was born at Verona in the year 1727. He learned the principles of drawing and painting in the school of Francesco Ferrari, but feeling a strong desire to become an engraver, he copied, without any previous instruction, various prints by the most celebrated engravers. His earliest engravings, (after these preparatory studies,) were the medals for the book of the marquis Giacomo Mufeli Veronese.

He afterwards went to Rome with Mr. Adams, the English architect, where he engraved certain Roman antiquities, and, we believe, some of the ruins of Dioclesian's palace at Spalatro, after Clerisseau; besides many other plates from celebrated Italian paintings; and most of the prints for the Schola Italica of Gavin Hamilton. Strutt supposes that he visited England, but this is perhaps a mistake into which he may have been led by the circumstance of Cunego's having engraved for Boydell's collection, and for the Messrs. Adams. When he was about sixty years of age, he was invited to Berlin, to work perhaps as preceptor, in an academy of engraving, established by an individual named Pascal; where he engraved a great number of portraits both in the line manner, and in aquatinta, after Cuninghame; but this establishment not succeeding, he returned to Rome in 1789; in which metropolis, as is believed, he died within these few years. In the following list will be found mentioned all his works that are of any importance.

Portraits engraved after Cuninghame.—Frederick II. king of Prussia, a whole-length figure, with the two favourite leverets of the king, in aquatinta; another portrait of king Frederick; two portraits of Frederick William, prince royal of Prussia; Frederica Charlotte, princess of Prussia, represented walking in a garden; and Frederick-Louis-Charles, Frederick-William, and the princess Frederica, whole-length figures, all of large folio size.

Subjects for the Schola Italica of Hamilton.—"The Creation of the Waters," in small folio; "The Creation of the Sun and Moon," in large folio; and "The Creation of Adam," in folio, all from Michael Angelo, in the Sistine Chapel; "Fornarina, the Mistress of Raphael," after a picture by that master, at the palace Barberini, small folio size;

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size; "Galatea on the Water," from Raphael, in the Farnese Palace, in large folio; "The Daughter of Robert Strozzi, a Florentine Nobleman," from Titian, in folio; "The Rape of Ganymede," after Titian, in small folio; a head, with a long beard, after Bassan; a bust of St. Jerome; St. Hieronymus, from Guido; bust of an old man after the same painter; a fine head of a Mary Magdalen, after the same, in small folio; a half-length portrait of an old man, after Guercino; "The Infant Prodigy," after a picture by the same master, in the palace Lancellotti, at Rome, all of folio size; "The Birth of St. John the Baptist," and "Providence," surrounded by children, both of large folio size, after L. Caracci; "Galatea on the Sea," after a picture by Augullino Caracci, in the Farnese Gallery; "Apollo and Silenus," from Annib. Caracci; "A Penitent Magdalen lying on Thorns," after the same; "A young Man and Woman in Conversation," after Giorgione; "Apollo supporting the wounded Hyacinthus," after Dominichino, at Rome; "The Death of St. Cecilia," from the same master; and "Two Nereids, accompanied by three Cupids," from Albano, all of large folio dimensions.

Subjects after various Masters.—Benedictus Josephus Labre, Bononiensis, And. Bleg. pinx. in large folio; Clement XIV. (Ganganelli) Gio. Dom. Campiglia pinx. in folio; Frederick Christian, prince royal of Poland, and elector of Saxony, drawn and engraved by Cunego, at Verona, also in folio; Eques Antonius Raphael Mengs, se ipsum pinx. ; "The Virgin with the Holy Infant in her Arms," A. R. Mengs pinx. both in quarto; five large plates, from the pictures of Raphael Mengs in the library of the Vatican; "St. Basil celebrating the Greek Mass," after P. Subleyras; one of the altar-pieces of St. Peter's at Rome, executed in Mosaic, large folio size; "Juno with the Cestus of Venus;" and "Hebe presenting the Cup to Jupiter," (companions) of folio size, both after Gavin Hamilton; the *l'Allegro* and *Il Penseroso* of Milton, folio size; "Innocence, with a Lamb," a very interesting print, with much of truth, sincerity, and simplicity of character and expression, and which does honour both to the painter and engraver; "Briseis taken from the Tent of Achilles, who is regretting her Loss;" "Achilles mourning over the dead Body of Patroclus;" "Achilles dragging the dead Body of Hector at his Chariot Wheels;" "Achilles delivering the Body of Hector to Priam;" "Andromache mourning the Death of Hector," all of large folio size, from Gavin Hamilton; "Brutus swearing to revenge the Death of Lucretia," in folio, from the same painter; a half length of "The Virgin and Child," from J. B. Cignaroles; the same subject from Correggio; "A Magdalen," from the same painter; "The Apostle St. Andrew," after Guido Cagnaci; "St. Thomas of Villanova," from Ant. Cavazoni; "A Philosopher with a long Beard," from Cellani; "The Sick healed," after L. Caracci, all of folio dimensions; "Christ bearing the Cross," a very grand composition, after Raphael, in large folio; and "Christ laid in the Tomb," a very large upright plate, after Espagnoletto; "The Godhead in the Heavens, attended by Angels," from Dominichino, in folio; "The Annunciation," from the same painter, in large folio, from the chapel of Noli; "The Visitation;" "The Nativity;" "The Circumcision," all in large folio size; "The Adoration of the Kings;" "The Presentation in the Temple;" "The Flight into Egypt," of folio size, in a circle; "A dead Christ, with the two Marias and Angels," in large folio; and a very large upright plate of "The Virgin in a Radiance of Glory, surrounded by Angels, and crowned by the Holy

Trinity," all from Dominichino; "Rinaldo asleep on the Car of Armida, which is drawn by winged Dragons;" "Guercino da Cento pinx. Romæ in *Ædibus Collaguti*, Dom. Cunego sculpsit," of very large folio size; "Time discovering Truth," a fine composition, executed at Rome in the palace of the marquis Collaguti, in six large plates independent of the general plan of the ceiling; "The Last Judgment," from the Sistine Chapel of the Vatican, after Michael Angelo, a very large plate; the corners of the same chapel from the same painter; an antique tomb, on which is represented a bacchanalian bas-relief, found in the Villa of Cafali, in 1767, in folio; and thirteen views of antique edifices and celebrated ruins in Italy, after Clerisseau, on large plates, engraved with boldness, but very inferior, in taste and style, to the best representations of such subjects, by Piranesi and Rooker.

Giovanni Battista Cipriani should not be left unmentioned among the Italian engravers of this period. Of his biography we have already treated. (See CIPRIANI) He etched several plates with considerable spirit, and a simplicity of style in his handling, which borders on dryness, of which some are from his own composition, and some from those of other masters.

Among these are several portraits of distinguished characters, who lived in the time of Cromwell, of which four heads of Milton, which being taken at different periods of his life, from infancy to age, form an interesting physiognomical series, are particularly worthy of notice. They are rare, and intrinsically valuable prints, of 4to. or rather small folio size, in ovals, and are done from originals which were in the possession of T. B. Hollis, esq. and which, therefore, have every claim to authenticity.

He also etched, "The Descent from the Cross," after Vandyke; "The Death of Cleopatra," after Benvenuto Cellini; and "The Descent of the Holy Ghost," after Gabbiani; and, from his own design, "The Mother and Child," in folio, and some others.

Gioseffo Zucchi was born at Venice A.D. 1730, where he worked for some time in conjunction with Amiconi and Wagner, engraving for the same sets of rural and historical prints, in which appear the names of Wagner and Bartolozzi. He afterwards went to Florence, where he painted the ornaments of the principal pleasure houses and villas in that city and its neighbourhood, from which prints were engraved. Of these he himself engraved two, and in many of the other plates he etched the figures. He also engraved after different masters and from his own compositions, many other subjects, among which are the following:—A half figure of a man, with a furred hat on, in 4to.; rural conversation; "The Passage through the Red Sea," in large folio, supposed to be after Bourguignon; "The Virgin and Child crowned by Angels," after Guido, in 4to.; "Joseph sold by his Brethren;" "The Rape of Europa," after Pefaresse; "The Mask of Vice taken from History" after Balt. Franceschini; "Virtue seizing Love by the Wings," from the same master, all of quarto size; "Offerings to Ceres;" after P. Cortona, in folio; "The Choice of Hercules," after the same painter, in folio; "The three Graces," one of whom plays the lyre, while the other two are singing, after P. Cortona, of quarto size; and "Eneas descending to Hades," after Solimene, in small folio.

Gioseffo Zucchi, the younger, was born in the same city A.D. 1732, and was probably related to the fore-mentioned artist. He came to London in quest of professional employment as an engraver; and here he became acquainted with Angelica Kaufman, with whom he travelled to Rome, and afterwards married. The engravings that we know of, by

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this artist, were all executed at London, from which it appears, that after he had once ingratiated himself into the good graces of Angelica, he engraved no more.

The subjects of Zucchi's prints are as follow:—"The Muse Erato," after Angelica Kauffman, in folio; "The Muse Urania;" "The Symbol of Simplicity;" "Calypso invoking Heaven and Earth to witness her Affection for Ulysses," in large folio, from Ang. Kauffman; "The Judgment of Hercules," from P. Cortona; "An Offering to Ceres," both in large folio; "Eneas and Dido taking refuge in the Grotto," after Guido; "The Virgin with the Holy Infant in the Clouds, surrounded by Angels," from the same master, in folio; "The Virgin and Child with St. John, between two Saints," Bartolomeo pinx.; "The Denial of St. Peter," from Guercino; "Jupiter and Europa accompanied by Nymphs;" and "Jupiter and Europa on the Waves of the Ocean, accompanied by Cupids," all of folio dimensions.

Giovanni (or John) Volpato, was born at Bassano, in the Venetian territory, in the year 1738, and in his early youth practised embroidery, which he learned of his mother, but afterwards applied himself to the study of engraving, which he followed for some time without any master, urged by the force of his own inclination, or attracted by such beauties of the art, as he saw in the print shops of Bassano.

He made a journey to Venice for the sake of obtaining information on what had now become the settled subject of his studies. Here, for some reason that has not transpired, perhaps from youthful affectation, perhaps from diffidence, he published his first plates under the assumed name of John Renard, and here he was first made known to the celebrated and benevolent Bartolozzi, who interested himself in the welfare of the young artist, and imparted to him the information of which he came in quest.

Volpato now felt more confidence; no longer withheld his name from the public, and soon produced engravings after Amiconi and Piazzetta, which obtained him approbation and encouragement, and were followed by others after Maiotto, Zuccarelli, and Marco Ricci.

From Venice our engraver travelled to Rome, where his abilities soon established him as a reputable engraver, and where his largest and best works were performed. A society of amateurs, very fortunately for him, had about this time conceived the project of patronizing the first engravers of the country, in the production of a set of large plates after Raphael's pictures in the Vatican; and among those who were engaged, none distinguished himself more by his industry, nor perhaps by his talents, than Volpato, who continued for many years to enrich the public with large plates, which have obtained him much praise from the critics and connoisseurs of the continent, and which are engraved after the very finest pictures that have been produced since the revival of art.

This was a noble race for an engraver to run, and his pupil and son-in-law Raphael Morghen is now following with superior brilliancy in the same course.

The works of Volpato have been the subject of eulogium with Rost, Huber, and some other of the German, French, and Italian writers upon art, but, in the estimation of the present writer, are deficient in richness and variety, and are more the result of mechanical care and patient industry, than of taste and feeling. His lights especially, when compared with those of Gerard Audran, Giacomo Frey, sir Robert Strange, or his countryman Schiavonetti, of whom we are about to speak, are either papery, or cold and metallic. There is no playfulness of pencil; no evidence of a mind

that glows and moves through its work with painter-like felicity, but the spectator is perpetually reminded of the rigid and undeviating course of the graving-tool; and though the chaste forms and pathos of Raphael will always give a certain value to the works of Volpato, and even afford some argument in favour of the dryness of his style, posterity will not place him in the very first rank of engravers.

Indeed, so dead was our artist to the more exquisite susceptibilities of his art, or so eager for the obtainment of profit, that (like those in our own country who have converted Macbeth into a burletta) he joined with Du Cros, and his little school of petty colourers, in a scheme for painting over with water colours, his smaller sets of engravings from the gallery of Caracci at the Farnese palace, and the Loggio and Stanzas of Raphael at the Vatican, besides some sets of prints on a larger scale, of views in Rome and its environs.

Now, in works of this kind, the addition of colour, especially if some of the pigments employed be opaque, (as is the case in the coloured prints of Volpato,) inevitably destroys the beauty of the engraving, which in its turn mars that of the colours. It is, therefore, a mode of mutual destruction in art, which is justly regretted by those who know, or who believe, that the art of engraving is capable of becoming, of itself and without extrinsic addition, an appropriate vehicle for rendering every perfection that painting has yet attained.

In England we are but emerging from the mistakes into which coloured works of this kind, aided by the cupidity of dealers, had plunged the national taste, and we therefore may at least stand excused, if we dwell upon the misfortune to art that must ensue when a distinguished professor joins his efforts with those of the mistaken sons of commerce, to break down the natural barriers between one art and another, and obliterate the delicate lines of demarcation which the finger of science has traced upon the orb of the intellectual world.

"According to an ancient fable, which has an excellent moral, the blustering music of Pan did for a while seem successfully to silence the chaste harmony of Apollo; and as the senses of the vulgar, we know, are powerfully assailed by red, blue, and yellow, however "idly spread," it may yet be some time before the multitude are sufficiently informed, entirely to discard coloured engravings; but as even the tea-gardens have at length shut out coloured statues, we cannot despair. Though the gaudy bubble may float awhile in the dense atmosphere with which fashion has surrounded and chilled the sphere of British engraving, it will sooner or later burst; and though some few, perhaps more than a few, shallow and inaccurate observers may for a time be pleased to their cost, all mechanical modes of picture-making will eventually sink into contempt, and painting and engraving will triumph as distinct and separate arts.

"As we frequently hear the uninformed talk as if they conceived the highest effort of painting was merely to copy nature as nature appears to them, so it is very common to hear unreflecting people speak of engraving, as if it were no other than an art of copying that of painting; which, though a great mistake, is yet a very pardonable mistake on the part of those who have been led into it, when we consider the state in which the art of engraving has hitherto existed, and the difficulties, and the degradation, under which, in this country, it has hitherto laboured.

"Now engraving is no more an art of copying painting, than the English language is an art of copying Greek or Latin. Engraving is a distinct language of art; and though it may bear such resemblance to painting in the construction of

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of its grammar, as grammars of languages bear to each other, yet its alphabet and idiom, or mode of expression, are totally different; if English be made the vehicle of the same thoughts which have previously been imparted to us by painting, it affords the means of affecting our minds in the same manner; this similar affection of the mind has led to the mistake, and little doubt may be entertained but that English would have been inconsiderately called an art of copying Greek, if we had never read any other English than translations from the Greek.

"The pretensions of engraving, as of all the arts denominated fine, are simple, chaste, unsophisticated. Art ever disdains artifice, attempts no imposition, but honestly claims attention, as being what it is. A statue is to be looked at as being a statue, not a real figure; a picture, not as a portion of actual nature; a print, not as a *copy* of painting.

"Engravings, therefore, such as those of Volpato, are no more copies of Raphael's original pictures, than the same compositions, if sculptured, or modelled in low relief, would be copies. In both cases, they would be, not copies, but *translations* from one language of art into another language of art.

"But absurdity blossoms luxuriantly, when engrafted on an original stock of error; and this vulgar and erroneous notion, that an engraving is a copy of a painting, has been assiduously cultivated by the avarice or ignorance of the dealers in prints, who always follow and pamper the taste of the mob, be it ever so depraved, provided it be profitable. That grass was green, and that soldiers' coats were red, was known to the most ignorant of the gaping multitude, and has given wings to credulity, and currency to empiricism. Neither is it of the smallest importance whether ignorance or the unprincipled love of gain have contributed most to the production of this effect, since the public taste in either case has equally suffered. It is error sufficient to call for animadversion here, if the print-sellers, (possessing, or possessed by, this mistaken notion, and with the view of making the copy, in their own vulgar estimation, approach nearer to its original,) have caused colours to be literally and barbarously added to engraving: for to colour a legitimate engraving is not less palpably absurd to an eye of tasteful discernment, than it would be to colour a diamond, which, as every one knows, would but obscure the native brilliancy and beauty of the stone. And if a good engraving must thus suffer by being coloured, so neither can bad ones be thus converted to good pictures: at the utmost, nothing better than a sort of mule production, (such as those by Volpato and Ducros, which have suggested the introduction of these remarks) can thus be generated, though with much more of the ass than the horse in its constitution." Landseer's Lectures.

Again, these observations acquire force in a compound ratio to the merits in point of colouring, of the pictures from which coloured plates may be engraven. For example, Fyt, Teniers, and Vandyke are among the number of those painters who are justly esteemed inimitable for the beauty and harmony of their colours, and dextrous management of their pencils. If children could be brought, even in the way of copying, to pencil and colour like Fyt, Teniers, and Vandyke, those matters would lose their high reputation, and this part of the painter's art would be in consequence so depreciated, as to become of very little value. To pretend, therefore, to emulate the merits of a finely coloured and beautifully pencilled picture, so as to meet the eye, and merit a place in the cabinet, of a man of taste,—and to do this on prints, by the score or by the hundred,—is little less ridiculous than to talk of a machine for playing on the violin or organ, or of a mill for making verses.

We shall notice the works of this popular engraver, nearly in the order in which they were produced.

While at Venice, and under the tuition of Bartolozzi, he engraved

Portraits, of the doge Foscarini, and the procurator Pascal, of folio size, after Bartolozzi; a set of four from the Old Testament, in folio, from drawings by Bartolozzi, after the original pictures by Amiconi, of which the subjects are, 1. "The Finding of Moses;" 2. Laban searching for his Idols;" 3. "The Servitude of Abraham," and 4. "Moses erecting an Altar to the Lord." Eight conversational subjects, in small folio, after Maiotti; "The Orgies, or Feast of Bacchus," an historical landscape, done for Wagner, after Zuccarelli; "A Philosopher prostrate before an Altar, surrounded by Ruins," from the same master, both in large folio; an Italian landscape, with fishers; another landscape, and peasants; all from Zuccarelli; and two landscapes after the elder Brand, all of large folio size.

Plates engraved at Rome.—"The Four Sibyls of the Church of St. Mary of Peace," after Raphael, in large folio; "The Marriage of Alexander and Roxana," from the same painter; "Modesty and Vanity," after L. da Vinci, in square folio; "Perseus delivering Andromeda," from P. de Caravaggio; "Our Saviour praying on the Mount of Olives," from Coreggio, in large folio; "Mary Magdalen washing the Feet of Our Saviour at the Table of Simon the Pharisee," after P. Veronese; "The Marriage of Cana," after Tintoret, both of large folio size; and "The Gamesters," after M. A. de Caravaggio, in folio; all of which were for Hamilton's collection.

The Pictures of the Vatican, by Raphael, engraved in the line manner, on a very large scale.—"The School of Athens;" "The Dispute on the Holy Sacrament," or "Theology;" "Heliodorus chased from the Temple of Jerusalem;" "The Progress of Attila arrested at the Appearance of St. Peter and St. Paul;" "St. Peter delivered from Prison;" "Mount Parnassus;" and "The Burning of the City of Rome." "The Miracle of the Mass of Bolsenna," belonging to this set, is by Raphael Morghen, the son-in-law and pupil of Volpato.

Subjects from various Italian Painters, all very large.—"The Descent from the Cross," from a painting by Raphael, in the Borghese palace; "The Holy Virgin," named "La Saggiola of Florence," from the same painter; "The Holy Virgin of St. Mark," after Fra. Bartolomeo; "The Marriage of the Virgin," from Guercino; "Piety, or the Virgin of Pity;" and "Aurora," both from pictures by Guercino, in the Villa Ludovisi; "Day" and "Night," which form a set with the Aurora, by the same painter; "The Crucifixion," from a picture by Guido, in the church of St. Lorenzo, in Lucina; "The Venus" of Paolo Veronese, from the gallery of the Colonna palace; two subjects, with children, from Mola; a pair from the first navigator of Gesner, after F. Gianni; another pair after the same painter, taken from Gesner's *Idyllia*; two landscapes from Claude Lorraine, of which the originals were in the Colonna palace; a set of six, or rather three pairs, after Gavin Hamilton, of which the subjects are 1. "The Death of Lucretia;" 2. "Innocence," a plate of considerable merit and beauty; 3. "Juno;" 4. "Hebe;" 5. "Il Penforoso;" 6. "L'Allegro," and the two prophets and two sibyls, from Michael Angelo's pictures in the Sistine Chapel.

The following are of smaller Dimensions.—A set of thirty-six, in small folio, from the antique statues, with the dimensions, &c. an elementary work for students in the arts; a set from the Farnese gallery, consisting of three larger and three smaller

smaller plates, coloured; a set of eight views at Tivoli, coloured by Dueros and his assistants; another set of twenty views in Rome and its vicinity, coloured in the same manner, both folio books; another of fourteen ditto; another set of forty, from the Museum Clementinum; another set, printed on four large sheets, from Raphael and Julio Romano.

It is much to the honour of modern Italy, that we have to close our catalogue of its school of engravers with the mention of two stars, than which no brighter have shone in the hemisphere of the art.

Luigi or Lewis Schiavonetti, was born at Bassano, in the Venetian territory, in the year 1765. His father was a stationer, whose moderate circumstances enabled him to give to his eight children, the eldest of whom was Lewis, a useful but limited education. From his infancy he had a taste for drawing, and while his companions were at play, he was often seen kneeling on a stool in his father's shop, copying prints. By these, and such other means as he possessed, he attained such proficiency, that Julius Golini, (an able painter, to whom some of these early attempts were shewn,) undertook to instruct him in the art of drawing.

At the age of thirteen, Lewis was placed under his care, and the high opinion which he had formed of the boy's genius, was confirmed by the rapid progress he made, while his amiable disposition endeared him so much, that Golini loved him as his own son. After three years, however, of useful instruction on the one part, and docile attention on the other, his tutor, unfortunately for our young artist, was attacked by a mortal disease. Lewis attended him during his illness with filial assiduity, received with becoming reverence his dying counsel and admonitions, and had the heart-piercing grief to see his master expire in his arms.

Being now left to pursue his own course, or assisted only by such advice as could be obtained in a town where Golini had been the only painter, he turned his views towards count Remauidini, who, though ennobled by this title, is proprietor (as it should seem) of an extensive typographical and chalcographical concern, and has inscribed on marble how much he feels himself honoured by having published some of the works of Bartolozzi and Volpato.

The works of these distinguished artists gave fresh impulse to young Schiavonetti's ardour for improvement, and becoming acquainted about this time with one Lorio, an indifferent engraver, who was barely competent to teach the mechanical process of the art, he applied to him for instruction. Unable to support himself and family by his graver alone, Lorio officiated as sacristan to a church, and could offer our artist no better accommodation for a study than the sacristy afforded, but which, his circumstances not allowing him to apply elsewhere, he was obliged to accept.

Schiavonetti remained with this master about twelve months, when finding he had exhausted his fund of instruction, and feeling an aversion to studying occasionally among dead bodies, he resolved to alter his situation. A copy which he had executed in the line manner, of a Holy Family, from Bartolozzi's print after Carlo Maratti, gained him employment from count Remauidini, and attracted the notice of another printseller of Bassano, of the name of Santach; and between these rival printfellers it is probable that Schiavonetti might have long continued to exist on such patronage as consisted with their views of profit, but for the kinder and more advantageous notice of some Venetian noblemen, and the occurrence of those circumstances which ended in his migration to England.

As these circumstances have been detailed in print, in such a manner as to stigmatise a certain naturalized subject of these realms with the reproach of having taken mean and

selfish advantage of the yielding simplicity of Schiavonetti, and the credulity of Bartolozzi, with the view of converting to his own use and profit the abilities of the former, and the hospitality of the latter; and as the accused party has publicly required time for the collection of such documents as might exculpate him from the charge, which documents he has not yet produced:—in such a state of evidence, it may be sufficient to say of our engraver, that, after enduring some further difficulties and disappointments, and after residing a while under the roof, and receiving the instruction, of Mr. Bartolozzi, he, in concert with his brother Nicholas, commenced an independent establishment.

From Bartolozzi's house at Northend, he removed to Sloane square, and from thence to Brompton, where he continued, to the hour of his death, to cultivate and improve the talent that Providence had bestowed on him, uncheered by the sunshine of patronage:—or cheered, or chilled, by such patronage only as consisted with the purblind views of commercial speculators, and exposed to the thousand nameless wrongs,

“That patient merit from th' unworthy takes.”

Some time about the year 1792, he entered into a partnership with certain printfellers, of which he had soon reason to repent; and, the partnership being dissolved, and himself in possession of some few engraved plates, he dismissed a younger brother to the continent on a printselling mission, which also ended in disappointment: for, the wretched vacillation of Prussian politics, and the inroads of French ambition, soon swept away the younger Schiavonetti from Berlin, which had been fixed upon as the head-quarters of their commerce.

During the short interval of peace between this country and France, he availed himself of the opportunity of visiting Paris, with the twofold object in view,—of improving his natural talent, of which he never lost sight,—and, obtaining such free access to the gallery of the Louvre, which was then thrown open to the public and supposed to contain the finest pictures in Europe, as might enable him to gratify himself with the pleasure and advantage of selecting one or more subjects to engrave, suited to his own abilities. This is a gratification in which engravers of genius are but too rarely indulged. The difficulties and delicacies of solicitation, the demands of commerce, and the purblind state of English patronage, (which, with all its benevolence, and all its power, has not yet emancipated itself from the mistakes and the fetters of trade,) are bars which, in this country, none have been able to overleap: yet nothing is more mentally obvious, than that other men can only judge of the talents of an engraver by what he *has done*, while the feelings of the engraver himself, if he has any, inform him, at the sight of a gallery of fine pictures, what latent germs of genius or talent he may possess, adequate to the task of translating such of them as are painted with a spirit congenial to his own; what elements from the intellectual chaos of his untried powers may be called into existence; how far, through his means, the boundaries of the art itself may be extended.

The shortness, however, of that lucid interval, marred, in some degree, the excellence of our artist's design, and compelled him to compromise with the madness of Europe, and his own untoward fortune. One of the subjects which he fixed upon was the *Madre Dolorosa* of Vandyke: but the return of war left him no alternative but to endeavour to satisfy himself as well as he could with a copy by another hand. The copy did not turn out very correct; yet from this indifferent copy, aided by Dolfwert's print from the

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same original, and his own strong recollections of Vandyke's picture, has Schiavonetti produced an engraving of very extraordinary merit, though on a much smaller scale than he had originally projected. What he intended to have engraven on an ample scale, for himself and the public at large, he was compelled by circumstances, which legislators and patrons would do well to attend to, to engrave small, and part with to the proprietors of the French national museum.

A very few years before his death, he formed an intention, which he communicated to his friends, of returning to Italy, or at least of removing to a more southerly climate; not that any serious apprehensions were then entertained on the score of his delicate health, but because he felt the weight of taxes, and the want of encouragement: and, perhaps,—observing how well the quackeries of mountebank pretension succeeded in this metropolis, and feeling how ill merit in his profession was rewarded,—he thought there was less of solid appreciation among us, than really existed. What delayed his departure, or altogether withheld him from going, the present writer can only conjecture; for he was shortly after disappointed of engraving a large plate from Mr. Devis's picture of "The Death of Lord Nelson,"—not because the fifteen hundred guineas, which he required for the performance of the task, was too much,—but because the sum which Mr. Bromley asked was too little. Perhaps he lingered here, and only delayed his departure on account of the continental war, and consequent difficulties of emigration; or, perhaps, he had reason latterly to entertain a better opinion of the taste and appreciation of the British public than he had before conceived, and began to find himself and his talents more an object of attention than his modesty had allowed him to suspect.

That he did not go, is, on the whole, to be regretted, as the soft air and genial climate of Italy would probably have lengthened his life; and with length of life, his reputation would have increased, and the public at large have been proportionably benefited: for it has been justly said of his latter productions, that they were marked by a wonderful degree of improvement, and that, had his life been prolonged, the fruits of this improvement would probably have been multiplied in abundance. The circumstance of his premature death gives, therefore, fresh cause to lament that the patrimony and the acquisition of genius are unalienable, and can never be bequeathed; and that talents, however rich, and however versatile, must inevitably perish with their possessor.

He died at his house at Brompton, of a pulmonary complaint, which had for some time been gradually undermining his constitution, on the 14th day of June 1810, and was attended to his grave, in Paddington church-yard, by a long and numerous procession of artists and amateurs, who loved and honoured him as an artist, and his probity as a man.

In his person, Schiavonetti was rather tall; the fine proportion in the divisions of his figure gave him a graceful movement; his manners were gentle; in his address there was sweetness and affability; and persuasion hung on his lips. He was dignified without austerity, and meek without insipidity. His whole deportment was manly. His amiable modesty of character, equability of temper, and promptness to oblige, won the good will of all who saw and conversed with him. In company with his brother artists, he seemed unconscious of his own superiority: though fitted to rank with the highest, he exacted no distinction of notice, but kept himself on a level with the lowest; and by the deference with which he spoke his opinions, made every one feel at ease in his society. This urbanity of manners, is but too commonly an extrinsic accomplishment;

but in him it was the unaffected expression of innate goodness of heart, and liberality of mind. It was not the varnish of a coarse material, but the polish of a fine one. Many acts of his private life might be adduced in support of what is here said in his praise:—one may be selected that exhibits a trait illustrative of his whole character. As soon as he began to derive profit from his profession, he devoted a portion of it to the support of his poorer relatives in Italy; and of late years he constantly remitted to his aged parent a stipend sufficient to ensure him comfort and respectability.

The same energy and elegant simplicity, which was observable in the personal character of our artist, predominated also in his engravings. He possessed, in very high perfection, that first requisite both in painting and engraving, freedom blended with accuracy of delineation. This power, united to the grace and dignity which characterized his style, enabled him to treat every subject on which he exercised his talents, with a truth, distinctness, and propriety of expression, rarely to be found in the works of other artists. By a varied choice of models, and a bold and independent habit of thinking, in particular, by fixing his attention strongly on the merits of the best works of our countrymen Strange and Sharp, he enfranchised his mind from the dogmas of school discipline, (which is said without any particular reference to his early tutors,) and stood forth an original, and if not a self-taught, a self-reformed engraver. In the works of common artists, we see only the labour of the hand; but in his, the hand is manifestly directed and controlled by the mind. What is their ultimatum, was only his instrument: he handled it with perfect command; he thought over it with nice discrimination; and as stagnation in the world of art, as well as in the physical world, engenders corruption, and as *manner* is the corruption of *style*, Schiavonetti has entitled himself to all the praise that Mr. Cromek (from whose memoir of this artist our account is partly extracted) has bestowed on him, for the dignified ease with which he kept far aloof from that mechanical sameness on all occasions, which we denote by this term, and for always preserving that superintending mental delicacy, that store of knowledge, and that fine state of nerves, which enabled him to vary and adapt the language of his art to the peculiar beauties and merits of the various originals, which from time to time he had to translate. Some of his less informed critics have praised the *beauty* of his manual execution. It is beautiful; but to say so, is like praising the personal beauty of Lucretia. Dazzled by the sun-beams which glitter on its surface, they fathom not the depth, and know not the navigable benefits, of the current. But perhaps posterity will but gradually learn to appreciate his merits as they deserve.

That his powers were not less versatile than vigorous, may be seen by comparing his etchings with his chalk engravings, and both with his exquisitely finished plates in lines; of which latter, owing to the bad taste that has hitherto prevailed since his arrival in this country, the number is unfortunately small.

His principal engravings in the Chalk manner, are, two, of "The Five Senses," which, with the frontispiece, form a set of six plates, in small folio, all from his own designs; "The Messiah hurling Thunder," after R. Westall, R. A. for Boydell's edition of Milton, large 4to.; "The Body of Tippoo Sultan recognized by his Family, after the Capture of Seringapatam," from R. K. Porter, in large folio; a set of the Cries of London, in large 4to.; three, of a set of the sacraments, after R. Westall; "Puck, seated on a Mushroom," after Sir Joshua Reynolds; a set of four folio plates, from the designs of Benazech, of "The Sufferings of Louis XVI. during his Captivity

tivity in the Temple;" "Queen Elizabeth receiving News of the Death of Queen Mary of Scotland," after R. Westall; "The red Slippers," from the same painter; two folio plates for Boydell's Shakspeare, of which, one in particular, "The two Gentlemen of Verona," after Angelica Kauffman, is a very capital print. The name and talents of Schiavonetti were but little known when he undertook this plate, and he engaged to engrave it for the low price of two hundred and eighty guineas. It is to the credit of the late Mr. Boydell, that he voluntarily increased this sum to three hundred. The portraits of Albert Rubens, after Rubens, in folio; the queen of Prussia, after Tischbien; and the duke of York, after J. Boyle, both in folio; Mrs. Damer, after Cofway, in 4to.; and the right honourable W. Pitt, and lady Cawdor, in small folio, after Edridge.

But far beyond these in merit and importance, is a large folio print of "The Landing of the British Troops under Gen. Abercrombie, in Egypt," after de Louthierbourg, in which the fire, freedom, and vigorous chiaroscuro of that master are most happily rendered, and for the production of which, the society in the Adelphi for the Encouragement of Arts, &c. did themselves the honour of presenting the engraver with a medal. By a judicious admixture of stippled hatchings, in imitation of chalk drawing when performed by the hand of a master, Schiavonetti has here revived with superior brilliancy and effect, the real chalk manner of engraving, which we call thus in contradistinction to Ryland's art of imitating stumped drawings, or what the French aptly term "en manière de crayon noir," and has even enlarged the former boundaries of this mode of art. On the whole, this is probably the most perfect chalk-engraving that has yet been executed, and of itself, would be a monument of reputation in this branch of the art.

The chief of his *etchings* are, a set of twelve, in small folio, from drawings by W. Blake, of which the subjects are taken from Blair's poem of the Grave. These are works of great merit, and (as we venture to pronounce) of lasting reputation; and though it be too true, that, in the words of this poet

"The best concerted schemes men lay for fame
Die fast away; only themselves die faster;"

they yet prove, in opposition to his leading sentiment, that it is not

"Absurd to think to over-reach the grave,
And from the wreck of names to rescue our's."

Faithfully adhering to the character of art that is implied by the term *etching*, Schiavonetti is here slight and sketchy, and has produced his effects chiefly by the operation of aquafortis, with his usual fine feeling, and a congenial unstudied simplicity of style. The eye of discernment immediately sees that the same high finishing which he bestowed on his plates after Vandyke, was never intended, and that what was intended is precisely accomplished.

Of this series of meritorious etchings, which were printed with Blair's poem and an able preface by the professor Fuseli, and published by Mr. Cromek, the subjects are 1. The Descent of Christ into the Grave; 2. The Descent of Man into the Vale of Death; 3. Death's Door; 4. The strong and wicked Man dying; 5. The good old Man dying; 6. The Soul hovering over the Body; 7. The Soul exploring the recesses of the Grave; 8. The Counsellor, King, Warrior, Mother, and Child in the Tomb; 9. The Skeleton re-animated; 10. The Re-union of Soul and Body; 11. A family Meeting in Heaven; and 12. The Last Judgment. These are preceded by a portrait of Mr. W. Blake,

the poetic designer of the work, after T. Phillips, R. A. in which our engraver has manifested great judgment and taste. It is also an etching, treated in the vignette style, with small assistance from the graver and dry-point, where a certain degree of mellowness or blending were wanted, and the whole brought to a focus in the animated and thinking countenance which is the proper subject of the print. Two etchings after Caracci, in folio, were afterward finished in aquatinta, for Mr. Chamberlayne's work from the Royal collection; two unpublished large folio plates of "The Departure, and the Return, of the Savoyard Musicians," slight, but performed with singular felicity.

Finished Engravings.—"The Madre Dolorosa," or dead Christ on the Lap of his Mother, after Vandyke, which he engraved in small folio, for the French publication, after their national gallery at Paris, is of a distinct class and character, from the above; more elaborate, more difficult of accomplishment, and combining merits of a loftier and more exquisite kind.

Here the mellow and harmonious mixture of etching, with the work of the graver and dry needle; the various combinations, by means of these instruments, of clear, broken, contrasted, and partially obscured, lines and stippling, by which he has expressed in their respective degrees of subordination to the purpose of the painter, rock, sky, hair, white and coloured draperies, and, above all, the anatomical markings, carnation tints, and fleshy texture, of the exquisitely finished naked figure of Jesus Christ, are truly admirable! and if not unparalleled, have certainly not been surpassed. Nor are the extremities of every figure in the composition rendered with less of taste, knowledge, or skill. Bollwert had engraved a larger print of this subject from Vandyke's original picture, a print of great merit; and to a nice observer, it is interesting to compare the details of the two engravings, and see how sedulously, and with what delicacy of discernment, the Italian artist has avoided every error, and improved every beauty, of the Fleming.

It is exceedingly to be regretted that among the works of Schiavonetti, we find so few of this inimitable class, for no man more than he, has united the excellencies which must enter into the constitution of a highly finished engraving. Another of these highly finished engravings, which is also after Vandyke, and of large 4to. size, is a portrait of the painter himself, habited as a peasant, and the same general observations will apply to both, for both are admirable epitomes of the powers of Vandyke; of the latter it has been truly said, that "its excellencies will be found to consist in its being at the same time a complete epitome of the original picture and of the powers which an engraver of genius can display upon so confined a subject as a half length figure, without landscape, sky, or any other accompaniment of back ground. It is throughout quite as well drawn as Vandyke's original; the texture of flesh is as perfectly expressed, with all its varieties and inflexions of surface and chiaroscuro; nor is the drapery less well felt and understood, nor scarcely less skilfully engraven, than the naked parts of the figure; all are sufficiently finished, but without petty trickery, or vain labour, and the eye sparkles with all the fire of Vandyke's."

These remarks are taken from "The Review of Art," (vol. i. p. 40.) which proceeds to state what is equally applicable to both these engravings after Vandyke, namely, that "in addition to all their other perfections, they powerfully suggest the idea of colour, mingling its magic blandishments with those of light and shade; and present the most perfect example we have yet seen on paper of the style of Vandyke's pencilling, and Vandyke is in this respect the

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very perfection of style, or at least approximates the nearest to it of any painter whatever, except perhaps Fyt, who exercised his powers on subjects of quite a different kind."

Another 4to. plate, which our artist engraved after a very excellent picture by R. Smirke, R. A. as an accompaniment to Joel Barlow's *Columbiad*, and of which the subject is "The Triumph of the Holy Inquisition;" some plates which he engraved for Sharpe's *British Classics*, and two for an edition of Homer, after the academicians Fufeli and Howard, possess merits of a similar kind, though, on account of the smallness of the scale, they could not be so effectually displayed.

The remainder of his finished engravings in lines, are the hovel scene in *King Lear*, after Smirke; and two or three other plates for the smaller edition of Boydell's *Shakspeare*, which are among the very best in that motley and undigested work; and some small portraits, particularly one of Mr. W. Cunningham (an Irish gentleman, distinguished for his taste and patronage of the fine arts); another, of a writing master, well known and distinguished in his profession, and a bust of Homer, from the celebrated marble in the Townleian Collection, all of 8vo. dimensions.

His folio print, engraved in the fourth remove from Michael Angelo's celebrated Cartoon of Pifa, is of a middle character, less elaborate than his prints from the pictures of Vandyke, though somewhat more so, than his etchings after the poetical sketches of Mr. Blake: in short, a graphic translation of a Cartoon, or preparatory study for a high-finished picture.

His academical knowledge and skill were here, perhaps more than in any other of his productions, called into action, and their strength put to the test. Nothing stood higher in these respects than the reputation of the great original, which is even, by Benvenuto Cellini and other excellent judges, esteemed the masterpiece of Michael Angelo: and this high reputation Schiavonetti had not merely to sustain, but in some degree to restore; for the Cartoon itself being destroyed (in a fit of envy, as it is said, by Bandinelli, who was entrusted with the key of the apartment where it was placed,) and the details of its superlative merits being known to us moderns, only through the media of Sangallo's copies, and the separate groups which have been engraved by Marc Antonio, Agostino of Venice, and other contemporary artists, whose works we have already enumerated under an early part of this article of the Italian school, our engraver felt it to be his duty to collate these versions and fragments of the Cartoon of Pifa with conscientious scrupulosity, and, by balancing probabilities, to restore what may be called the true classical reading. An awful task! yet which he has performed with the ability and success of a consummate scholar in art.

The reader should be apprised, that the Holkham copy, which is believed to be the work of Bastiano de Sangallo (an artist who was never held in any very high degree of estimation) was painted in his old age, from a small drawing which he had himself copied from the original Cartoon in the year 1542, during his pupilage. It was made at the request of Vafari, and, through means of Monsignor Jovio, came into the possession of Francis I. of France, who highly esteemed it; from his collection it however disappeared, and no mention is made of it by the French writers for near two centuries. It was probably discovered at Paris, purchased, and brought to England by the father of the late marquis Townshend.

Schiavonetti had not even this copy to work from, but a

copy of this copy, and has therefore, with commendable regard for his own reputation, and that of Michael Angelo, and with due respect for the public, who always ought to be rightly informed upon such occasions, followed the recommendation which was publicly laid before him in the *Review of Art*, vol. i. and scratched with his dry needle under the few proofs which were received as presents by his friends, "Engraved by L. Schiavonetti, after a copy painted by H. Howard, R. A. from da Sangallo's copy of his own study, after Michael Angelo's cartoon."

The same respect for truth and the public, which dictated this recommendation and this conduct, requires us to mention that Schiavonetti has corrected a general heaviness of drawing which prevails in Mr. Howard's picture, which heaviness that accomplished artist no doubt found in the Holkham copy, but which is perfectly inconsistent both with the active sentiment of the subject, and the earlier graces of Michael Angelo's composition. A foot of one of the principal figures, which is there turned inward, he has turned outward; and, beside some other minor details, has added requisite strength to the limbs of the figure who is climbing the rocky bank of the Arno. Whether our artist had seen the small fragment of Michael Angelo's original, which is said to be still in existence at Mantua, or of what part or parts that fragment may consist, the present writer is not able to say; but Schiavonetti was in possession of various old prints of its principal groups, of which we have already spoken in our accounts of Marc Antonio and his disciples, and which were executed for the most part during the lifetime of Michael Angelo, and from comparing them, and reflecting on the whole, has ventured on the above emendations of the extant copies.

As this cartoon of Pifa is esteemed to have been one of the most extraordinary works that has been produced since the revival of art, the reader will not be displeased to find here the following eloquent account of it, as delivered from the professor's chair of the Royal Academy of London, by M. Fufeli. It does not in all its details exactly tally with the print, but its general sentiment of impatient animation and patriotic ardour is precisely the same. "It represents an imaginary moment relative to the war carried on by the Florentines against Pifa; and exhibits a numerous group of warriors, roused from their bathing in the Arno, by the sudden signal of a war-horn, and rushing to arms. In imagining this transient moment from a state of relaxation to a state of energy, the ideas of motion, to use the bold figure of Dante, seem to have showered into the artist's mind. From the chief, nearly placed in the centre, who precedes, and whose war-voice accompanies the trumpet, every age of human agility, every attitude, every feature of alarm, haste, hurry, exertion, eagerness, burst into so many rays, like the sparks flying from a red-hot iron. Many have reached, some boldly step, some have leaped, on the rocky shore; here two arms emerging from the water grapple with the rock; there two hands cry for help, and their companions bend over or rush on to assist them; often imitated, but inimitable, is the ardent feature of the grim veteran, whose every sinew labours to force over the dripping limbs his clothes, whilst gnawing, he pushes his foot through the rending garment. He is contrasted by the slender elegance of a half averted youth, who sedulously eager buckles the armour to his thigh and methodizes haste; another swings the high-raised hauberk on his shoulder, whilst one who seems a leader, mindless of dress, ready for combat, and with brandished spear, overturns a third, who is crouched to grasp a weapon; one naked, himself buckles

on the mail of his companion, and he, turned toward the enemy, seems to stamp impatiently the ground. Experience and rage, old vigour, young velocity, expanded or contracted, vie in exertions of energy; yet in this scene of tumult one motive animates the whole, eagerness to engage with subordination to command; this preserves the dignity of action, and from a straggling rabble, changes the figures to men whose legitimate contest interests our wishes."

Three plates in lines, which lie advanced no further than the aquafortis state, will close our list of the works of this admired and regretted artist. The first, in the order of production, is a masterly etching of large folio size, after Trumbull, of "The Death of General Montgomery," which was finished by Mr. Clemens (a German artist). It was performed several years ago, and displayed powers which ought to have made an earlier impression than they did on the eye and taste of the public. The next is "The Procession of Chaucer's Pilgrims to Canterbury," a large folio plate of the frieze proportions, after a very capital work from the pencil of the academician Stothard.

Chastening every ambitious display of his own executive powers; repressing every idea and every feeling that was not homogeneous with the nature, and proportioned to the demands of the occasion, Schiavonetti has here, like the hero of the *Odyssey*, expressed, "no more than just the things he ought." The spirit which animated him in the performance of this work, like that which has animated the painter, seems to have glided from the elysium of the great artists of antiquity; there is the same truth of Nature, and the same unobtrusive classic purity of style, pervading the whole;

"Enlight'ning ev'ry line in such a guise,
That they seem rather fallen from the skies
Than of a Mortal hand."

Since the lamented death of Schiavonetti, the proprietor of this plate has with some inconsistency stated to the public, that, "in the present state of this etching, considered with reference to the peculiar circumstances of the case, perhaps no better mode could be devised of paying an impressive and lasting tribute to his memory, and one in which all his admirers could participate, than by giving it to the public as he left it, a consecrated monument of his genius;" he has before held forth a powerful additional motive to this end, a motive as powerful as taste and friendship themselves could have connected with such a purpose, by informing his readers, that "the movement of the figures and the expression in their heads and characters are as finely maintained in outline, as they could possibly have been in the most finished print," which is pretty strong language, yet he has since announced Mr. Bromley and himself as the finishers of the plate.

Now, though the present writer does not think finishing, in the engraver's art, is thus utterly thrown away, or contributes nothing in addition to an exquisite outline, to the motions, characters, and expressions of a protracted group of figures, such as the Canterbury pilgrims; or though, regarding the above as an impassioned, or hyperbolic sentence from the pen of Mr. Cromek; he can make due allowance for the occasion which gave it birth, he yet thinks the impressive and lasting tribute to the memory of Schiavonetti should have been paid; the monument which his genius itself had raised should have been consecrated; and he therefore regrets those views of profit, or those hopes of reputation, or those ulterior mistakes which have prevented this consummation. Achilles and Ulysses could not both be the heroes of the same poem; and it would have been wise for

Mr. Bromley, and well for the public, for him to have begun his Canterbury pilgrims on a fresh plate of copper.

The next, and the last of our artist's performances, was an etching, of folio dimensions, of the portrait of Sir Joseph Banks, as president of the Royal Society, from a picture by T. Phillips, R.A. replete with that truth of character and mild force of execution, which usually distinguish the works of this painter. To detail the merits of this work, would be but to call forth afresh our former praises; it is as masterly a display of his talent in the portrait branch of his art, as the etching of the Canterbury pilgrims is of his merit in the historical. This plate, as we are given to understand, is now finishing by Nicholas Schiavonetti, who may naturally be presumed to be at least as well acquainted with his brother's style and professional intentions, as any engraver whatever.

Of Francesco Bartolozzi of Florence, the pupil of Wagner, but more the pupil of Italy and nature, and the principal instructor of Schiavonetti and Volpato, we shall say but little. He is still at upwards of fourscore years of age, considered as speaking for himself by his productions, though doomed to linger out the evening of his glorious day, in Portugal, far from the haunts of studious retirement, and amidst the din of arms. Till nature has closed her account with him, what bold auditor shall presume to estimate his worth?

Of him and his disciple Schiavonetti, we have already spoken as two of the brightest stars in our graphic hemisphere. The latter has fallen from his zenith: that Bartolozzi may long remain above the horizon, is our fervent wish.

But it has been emphatically said, that "stars teach as well as shine." On the continent of Europe, they teach and shine in vain, while war desolates the plains of the western peninsula; if Ate flings wide and wild her torch, in vain exist the charms and the lessons of art: in vain are the heavens serene, if an earthquake rages below.

ITALIC, or *ITALIAN Hours*, are the twenty-four hours of the natural day accounted from the sun setting of one day to the same again the next day.

This way of reckoning was used by the Jews of old, and is used by the Italians to this day.

ITALIC Character, in *Printing*. See *LETTER*.

ITALIC Sed, is the name of a party of ancient philosophers founded by Pythagoras; so called, because that philosopher taught in Italy, spreading his doctrine among the people of Tarentum, Metapontus, Heraclea, Naples, &c. See *PYTHAGORIC Sed*.

ITALY, in *Geography* and *History*. In ancient geography, this country, the most celebrated in Europe, was denominated Italia. It is bounded on the N. and N.W. by the Alps; on the E. by the mare Superum, that is, the Adriatic gulf, or gulf of Venice; on the W. by the mare Inferum, or Tuscan sea; and on the S. by the Ionian sea adjacent to Greece. In form, it has been compared to the shape of a boot, lying in an oblique direction from N.W. to S.E. From the Alps to the fretum Siculum, or strait of Messina, it extends from 47° to 37° 45' N. lat. or about nine degrees. In breadth it is very unequal, in some places not exceeding 2°, and in others upwards of 8° long; hence its length from N. to S. is about 600 miles, and its breadth varies from 1 to 300 miles or more. It has borne at different periods very different names. One of its most ancient names was Italia, either from Italus, a king of that country, not known in history, or from a Greek word signifying an ox, an animal very common in that part of the

the country. It was denominated "Hesperia," on account of its western situation in respect to Greece; "Saturnia," from Saturn; "Latium," from the Latini; "Aufonia," from the Aufones; "Oenotria," from a tribe settled between Paestum and Tarentum. These names were originally appropriated to particular provinces, but in process of time they were applied to the whole country, which has been denominated the garden of Europe. The ancient inhabitants called themselves aborigines, offspring of the soil; and the country was, at a very early period, peopled by colonies from Greece. The Pelasgi and Arcadians made settlements there, and the whole country was divided into as many different governments as there were towns, till the rapid increase of the Roman power changed the face of Italy, and united all the states in support of one common cause. (See ROME.) Under the dominion of the Gauls and Greeks, Italy, in reference to its inhabitants, was divided into "Gallia Cisalpina," "Italia Propria," and "Grecia Magna;" the first comprehended the provinces lying between the Alps, and the Rubicon; the second included the intermediate provinces; and the third those adjacent to Sicily and Greece, and inhabited chiefly by Grecian colonies. It was divided into eleven small provinces or regions by Augustus; but according to the common and most approved division, ancient Italy consisted of two parts, *viz.* "Gallia Cisalpina," and "Italia Propria;" the former, likewise called "Gallia Italica," and sometimes "Gallia," was bounded on the N. by Rætia, and on the S. by the sinus Ligusticus, or gulf of Genoa. This province, while under the Roman dominion, contained several tribes, which will be noticed in their places. Italia Propria was on all sides surrounded by the sea, except on the N. where it was bounded by an imaginary line, extending from the mouth of the Macra to that of the Rubicon. It contained, among others, the following provinces, *viz.* Etruria, Sabina, Latium, Campania, Samnium, Apulia, Messapia, Lucania, and Bruttium. During the middle ages Italy underwent many revolutions, and frequently changed its masters. In the reign of Honorius the Visigoths, under the command of Alaric, penetrated into that fertile country, which they plundered from the foot of the Alps to the strait of Sicily. The reign of the Goths in Italy ended in Teia, Totila's son, who was defeated and slain by Narses in the year 553. Italy now became a province of the Greek empire. The Lombards were a fierce nation, first discovered between the Elbe and the Oder, from thence they descended to the south and the Danube. They afterwards passed the Danube, wandered along the coast of the Adriatic, and in the year 566, aided by the Avari, a Seythian horde, they undertook the conquest of Italy. Many provinces were added to their dominions, as a large portion of the Venetian territory, Tyrol, Milanese, Piedmont, the coast of Genoa, Mantua, Parma, and Modena, the grand duchy of Tuscany, together with a considerable portion of the ecclesiastical state.

Italy, in the modern acceptance of the word, includes both main land and islands. The former, by geographers, is commonly divided into upper, middle, and lower. Upper Italy, called Lombardy, contains seven duchies, ten small principalities, and two republics. Middle Italy consists of the grand duchy of Tuscany, the ecclesiastical state, and two republics. Lower Italy includes a part of ancient Italia Propria, and the kingdom of Naples. The climate of this country differs with its different divisions. In mountainous districts the air is keen and piercing; the provinces, north and east of the Apennines, are mild and temperate; those on the S. of that chain are warm, sultry,

and liable to torrents of rain. An account of the mountains, rivers, and lakes, belonging to Italy, or dividing it from other countries, will be found in the alphabetical order of this work. (See ALPS, APENNINES, PO, &c.) There is a very considerable diversity in the soil as well as the climate. The northern division exhibits the grand scenery of the Alps, contrasted with delightful vallies and plains, watered by many streams which run towards the south to augment the Po. In the central parts are marshes, stagnant waters, and fruitful districts. A great proportion of the kingdom of Naples (which see) is hilly, but many tracts, though subject to inconveniencies, are uncommonly fertile. Italy has been denominated the parent of plenty, and each province has its peculiar excellence and commodity; and, taken together, they all yield the comforts and luxuries of life in great abundance. In the time of Pliny, Italy was said to contain 14,000,000 of inhabitants. This was probably an exaggerated account. The present population, though not easy to be got at, cannot, with the islands of Sicily and Sardinia, be estimated at more than 13,000,000. Naples and Sicily are supposed to contain 6,000,000; the central part about 3,000,000; and the northern about 4,000,000. The manners and customs of the natives are various and discordant. The real Italians are in general well proportioned, affable, polite, profuse in their compliments, and nice in all punctilios of civility, observing, it is said, a due medium between the levity of the French and the gravity of the Spaniards. They are impetuous in their temper, keen in their resentments, revengeful in their manners, and superstitious in their religion. "Attached," says Mr. Playfair, "to ancient customs, they apprehend no occasion for improvement. Conceiting themselves to be the conquerors of the world, they look on the rest of mankind with contempt. Out of a vain ostentation, they lavish their money on paintings, gardens, and statues, on costly equipages, and a numerous retinue of servants; but this profusion does not seem to interfere with the economy of their tables, which are neither splendid nor expensive. Their dinner, consisting principally of roots and vegetables, is a slight meal compared with their supper; but at all times they eat and drink sparingly. Their houses, furniture, and entertainments, are a composition of magnificence and meanness. While they delight in outward show, they bestow little attention on the comforts of life. Masquerading, gaming, conversations, music, and religious exhibitions, are their chief amusements." The dress of the Italians is not materially different from that of the inhabitants of the neighbouring countries; and it has been observed, with much justice, that Italy, instead of being visited by travellers for the sake of its inhabitants, is visited only for the sake of the places which they inhabit. There are some remains of forests among the Apennines; but the early civilization of Italy has been disadvantageous to the growth of timber. The botanical products of Italy are supposed to be equal to those of any European country, on account of the great variety of its soil, the irregularity of its surface, and the genial benignity of its climate. In the southern parts, cotton, rice, and the sugar-cane, indicate the fertility of the soil, and the warmth of the climate; and the fields and the pastures bear a striking resemblance, in their native products, to those found in the southern provinces of Spain. The Italian horses are of little reputation, and the cows, from which the noted Parmesan cheese is made, are described as of a deep red colour, long, lank, and ill made. In Tuscany the art of fattening cattle is well understood. The buffalo is, in Europe, almost peculiar to Italy. This animal in some respects resembles the hog, being fond of

wallowing in the mud; his flesh is coarse, and his hide, though light, is so firm as to have supplied armour to the military. The marmot and the ibex are reckoned among the animals of the Apennines, and the crested porcupine is esteemed peculiar to the south of Italy. The Alpine district abounds in rich mines which are neglected: here are mines of silver, lead, iron, copper, and gold: in many parts there is excellent coal, and in detached hills throughout the country, marble, lime-stone, metallic ores and minerals are found. There are but few manufactures in Italy in proportion to the fertility of the soil. Those of silk and wool are carried on to a considerable extent: but great quantities of the raw materials are exported. Besides these, wine, oil, and fruits are exported in abundance. The chief imports are hard ware, metals, cotton, woollen and silk stuffs, leather, timber, pitch, &c. The skill of the natives in statuary, painting, and architecture, has been long the subject of admiration. The established religion is the Roman Catholic, consisting chiefly in external observances, rites, and ceremonies. The pope is still looked up to as the head of the church; but his power and influence are now almost wholly destroyed. Before the late revolution, the form of government in the states of Italy was monarchical, and in the republics it was aristocratical. The sovereigns governed their dominions with unlimited authority: in the republics of Venice, Genoa, and Lucca, the nobility shared in the management of the state. In the present unsettled situation of the country it is not possible to give any tolerable estimate of the revenues: they were reckoned between four and five millions sterling towards the close of the last century. Anciently, Italy gave birth to men illustrious in almost all the departments of science then cultivated: the generals, philosophers, historians, orators, and poets of Rome can never be forgotten. In the sixth century, when numerous tribes of barbarians overran the Roman empire, scarcely a vestige of literature and the fine arts remained. From this period until the 16th century, the human mind sunk into profound ignorance, but since the revival of learning very many eminent persons have appeared in Italy that have adorned the sciences and the various branches of literature. The elegant arts of sculpture, painting, architecture, and music have likewise been cultivated with success.

We have already alluded to the early history of Italy, which, in a few lines, we brought down to the invasion, and, indeed, conquest of that country by the Lombards. The great object of ambition to this new race was the entire conquest of all Italy, and this, as in almost all other similar cases, proved the ruin of their empire by Charles the Great, or, as he is generally denominated, the illustrious Charlemagne, who was crowned sovereign of that country in the year 800. As, however, the Lombards had never possessed the whole of Italy, so the whole of it never came into the possession of Charlemagne, nor, indeed, since the time of the Goths, has the whole extent of this country been under the dominion of any single state. The undisputed territory of Charlemagne in Italy was restricted to Piedmont, the Milanese, and the Mantuan territories, those of Genoa, Parma, Modena, Tuscany, Bologna, the dukedoms of Friuli, Spoleto, and Benevento, the last of which contained the greater part of the present kingdom of Naples. The feudal government which the Lombards had introduced into Italy produced several revolts, as the different dukes inclined, either to change masters, or to set up for themselves. Several of these rebellions happened during the life of Charlemagne, which, by the vigour of his mind and the decisiveness of his measures, he found means to crush; but after his

death, the sovereignty of Italy became an object of contention between the kings of France and the emperors of Germany. That monarch had divided his extensive dominions among his children; but they all died during his own reign, excepting Lewis, whom he associated with himself in the empire, and who succeeded to all his dominions after his death. Hence are dated those troubles with which Italy was so long overwhelmed, and of which, as they proceeded from the ambition of those called kings of Italy and their nobles, of the kings of France, and the emperors of Germany, it would be difficult to give our reader any satisfactory account, although we were to extend the boundaries of the present article much beyond the limits that can be allowed it. We shall attempt only an outline. At the time when Lewis, the son of Charlemagne, was declared emperor of the West, Italy was held by Bernard, the son of Pepin, brother of Louis. Though Bernard bore the title of king, he was only accounted a vassal of the emperor. He soon rebelled against his uncle, but being abandoned by his troops, and taken prisoner, he was deprived of his sight, and died in a few days; and in 823 the eldest son of the emperor was sent into Italy, of which country he was crowned king at Rome, and afterwards emperor of the West during his father's life-time. He also rebelled against his father, whom he took more than once prisoner, though in the end he was obliged to submit, and ask pardon for his offences. In the mean time the Saracens, taking advantage of the civil commotions, landed on the coasts of Italy, and committed such ravages, that even the bishops were obliged to arm themselves in defence of the country. Lothaire took but little care to put an end to these ravages, or to restore tranquillity, he even embroiled himself so far till he had lost almost all his dominions: at length he died, leaving his son Lewis the title of emperor, as well as that of king of Italy. Lewis applied himself to the restoration of tranquillity in his dominions, and the driving out of the Saracens from those places of which they had possessed themselves in Italy. This arduous task he fully accomplished, and obliged the infidels to retire into Africa, but in 875 he died, without naming a successor. After this event, the Italian nobles, headed by the duke of Tuscany, represented to the pope, that as Lewis had left no successor, the regal dignity, which had been so long usurped by foreigners, ought now to return to the Italians. The pope, however, crowned Charles the Bald of France emperor and king of Italy, on the condition of his acknowledging the independency of Rome, and that he himself only held the empire by the good-will and gift of the pope. This produced a serious conspiracy among the discontented nobles, of which the Saracens took advantage, renewed their incursions, and even threatened the ecclesiastical territories with the utmost danger. The pope earnestly solicited the emperor's assistance, but that prince died before he could afford him any effectual aid, and being distressed by the Saracens on the one hand, and the Lombard nobles on the other, the wretched pontiff was forced to fly into France. Italy now fell into the utmost confusion and anarchy; during which, many of the nobles and states of Lombardy assumed an independence which they have ever since retained. The pope, in 877, was re-conducted to Italy by Boson, son-in-law to Louis II. of France, whom the pontiff would willingly have raised to the dignity of king of the country, but he found his interest insufficient for the purpose, and matters remained in their former situation. The nobles became reconciled to the pope, but they renounced the authority of any superior, and every one claimed to be an independent sovereign of his own territories: they even applied to the pope, and requested him to join in asserting

ing the independency of Italy, and obtained from his holiness the two following decrees, *viz.* That the popes, after their election, might be consecrated, without waiting for the presence of the king, or his ambassadors; and that if Charles the Gros died without sons, the kingdom of Italy, with the title of emperor, should be conferred on some Italian nobles. The emperor felt himself neglected and insulted, and complained bitterly of being deprived of his right, and the dissensions between the Italian nobles became more fatal than ever. Two of these noblemen, Berengarius, duke of Friuli, and Guido, or Vido, duke of Spoleto, entered into an agreement, that on the death of the emperor, the former should seize the kingdom of Italy; and the latter on the kingdom of France. Berengarius succeeded without opposition, but Guido was disappointed: upon this he returned to Italy, and turned his arms against Berengarius, whom he drove into Germany, and obtained for himself the kingdom of Italy. He now employed himself in reforming the abuses of the state, and confirming the grants formerly allowed the pope, out of gratitude for his having sanctified his usurpation, and declared him lawful king of Italy. After the death of Guido, Berengarius became king of Italy, without a rival, and held his kingdom during the space of twenty years. In 924 he was treacherously assassinated at Verona. In 947, after the kingdom had undergone many changes, and suffered much from the incursions and cruelties of the Hungarians, Berengarius, grandson of the first king of that name, became possessed of the supreme power. He did not assume the title of king till after the death of Lotharius, which happened in 950; and in the mean time Italy was invaded by the united forces of Bavaria and Hungary. So formidable was their power, that Berengarius was obliged to purchase their departure with a large sum of money, which he raised by a very heavy personal tax laid upon every individual, without distinction of age or sex. In these efforts, Berengarius was more oppressive to his people than even the enemy had been: he, however, raised an immense sum of money, ten bushels of which he gave to the Hungarians, but kept the much larger portion for himself. After this he was attacked by Otho, king of Germany, who allowed him to retain his kingdom upon the hard condition of doing homage for it to the king of Germany. Berengarius did not readily submit to his fate: he rebelled against Otho, who, determined to support his authority by force of arms, brought an army into Italy, and was himself crowned king by the archbishop of Milan, and in the following year he received the crown from the hands of the pope. On this occasion, the holy pontiff and Otho went together to the altar of St. Peter, and bound themselves by a solemn oath; the pope to be always faithful to the emperor, and Otho to consult the welfare of the church, and to restore to it all its patrimony granted by former emperors. Otho bestowed rich presents on the church, but he likewise ordained that the election of the popes should be according to the canons: that the elected pope should not be consecrated till he had publicly promised, in the presence of the emperor's commissaries, to observe every thing formerly specified with regard to the rights of the emperors; that these commissaries should constantly reside at Rome, and make a report every year as to the manner in which justice was administered by the judges; and in case of any complaints, the commissaries should lay them before the pope; but if he neglected to attend to them, then the imperial commissaries might take what steps they pleased. Thus, however much Otho might allow the pope's supremacy in spirituals, he plainly assumed the sovereignty in temporals to himself, and thus Italy was, for upwards of 300 years, accounted a part of

the German empire. This long period we shall of course almost entirely pass over in this sketch. We find, in 1215, Frederic II. acknowledged emperor, and crowned at Aix-la-Chapelle. Shortly after this he was urged by the pope to undertake an expedition into the Holy Land against the infidels, but he refused, under various pretences, obedience to the mandate of his holiness, which caused the most decided hostilities between these great personages. Frederic renounced all correspondence with the pope, and set his power at defiance. The pope, convinced of his error, or at least of his not being able to support his power against that of the emperor, thought proper to soothe him by submissive apologies and gentle exhortations. They were accordingly reconciled. The pope shortly after this died; and Frederic, during the popedom of Gregory IX., undertook an expedition to the Holy Land, leaving the affairs of Italy to the management of Renaldo duke of Spoleto. The pope, hearing of his determination, prohibited his departure before he should be absolved from the censures of the church; but Frederic went in contempt of the church, and his success was very complete. The sultan ceded to him Jerusalem, and its territory as far as Joppa. Frederic had before acquired, by marriage, the title of "king of Jerusalem;" and now, by his moderation and great talents, he acquired the territory, to which were added Bethlehem, Nazareth, and all the country between Jerusalem and Ptolemais, Tyre, Sidon, and the neighbouring territories: in return for which, the emperor granted the Saracens a truce for ten years; and in 1230 he returned to Italy. The reign of this prince, after his return from the East, was one continued quarrel with the popes. He was excommunicated by Gregory IX.; and in his turn he proclaimed every where that Gregory was the "great dragon," the predicted "man of sin," the "antichrist," &c. In 1250, Frederic, after various troubles, died. From this time, the affairs of Germany fell into the utmost confusion; and Italy continued long in the same distracted state in which he left it. Conrad, the son of Frederic, assumed the imperial dignity; but after his death, there were several candidates for the high honour. No emperor, however, was properly acknowledged till 1273, when Rodolph, count of Hapsburg, was unanimously raised to the vacant throne. During the interregnum which preceded the election of Rodolph, Denmark, Holland, and Hungary, entirely freed themselves from the homage they were accustomed to pay to the empire; and about the same time, several German cities erected a municipal form of government, which continued till within these few years. Lubec, Cologne, Brunswick, and Dantzick, united for their mutual defence, against the encroachments of the great lords, by a well-known association, called the Hanseatic league; and these towns were afterwards joined by eighty others, belonging to different states, which formed a kind of commercial republic. Italy also, during this period, assumed a new plan of government. From the time of Frederic II. we may date the ruin of the German power in Italy. The Florentines, the Pisans, the Genoese, the Luccans, &c. became independent. At the commencement of the fourteenth century, Henry VII. undertook to restore the imperial power in Italy. For this purpose a diet was held at Francfort, where supplies being granted for the emperor's journey, well known in history by the name of the "Roman expedition," he set out for Italy, which was at this period divided by the factions of the Guelphs and Gibellines, who were destroying one another without humanity or remorse. Pope Clement V. had been obliged to leave Rome, which was in a state of anarchy; and owing to the divisions in that city, the holy pontiff's long

took up their residence in France, so that Rome seemed equally lost to the popes and the emperors. Sicily was in possession of the house of Arragon, in consequence of the massacre called the "Sicilian vespers," which delivered that island from the tyranny of the French. Robert, king of Hungary, disputed the kingdom of Naples with his uncle Robert. The old league of the Italian cities no longer subsisted. It had been formed with no other view than to oppose the emperors; and since they had neglected Italy, the cities were wholly employed in aggrandizing themselves at the expense of each other. In the midst of these troubles, Henry VII. appeared in Italy in 1311, and caused himself to be crowned king of Lombardy at Milan. But the Guelphs had concealed the iron crown of the Lombard kings, as if they regarded the right of reigning as attached to a circlet of metal. Henry, however, was not to be put off under such a pretence: he ordered a new crown to be made, with which the royal ceremony was performed. Henry was unable to restore the imperial power in Italy, and his reign was terminated in a few months. From this time, the authority of the emperor in that country consisted, in a great measure, in the convenience which the Gibellines found in opposing their enemies under the sanction of his name. The power of the pope was of the same nature, and he was probably less regarded in Italy than in any other country in Christendom. There was likewise a party who called themselves Guelphs; but they affected this distinction only to keep themselves independent of the imperialists. The most desperate wars were carried on by the different cities against each other: but it would be contrary to our plan to attempt to give a detail of them; and this is the less necessary, as nothing material was effected by their valour. By degrees this martial spirit subsided; and in the year 1492, the Italians were so little capable of resisting an enemy, that Charles VIII. of France conquered the whole kingdom of Naples in six weeks; and he might easily have subdued the whole country, if it had not been for his own imprudence. Another attempt on Italy was made by Louis XII.; a third by Francis I.; and during the reigns of Louis XIII. and XIV., an obstinate war was carried on between the French and the Spaniards, in which the Italian states bore a considerable share. The war concluded in 1660, with very little advantage to the French, who had never been very successful in their Italian wars. A similar want of success attended them in the war which commenced four score years afterwards: but the farther particulars relating to these other contents belong properly to the history of the different states into which that country was divided.

At present, the whole of Italy is subject to the control of the French emperor, who led his victorious troops over the Alps, and made himself master of the Austrian dominions in Italy. The battle of Lodi decided the fate of Lombardy. Verona, Tortona, Bologna, and Urbino, quickly yielded to his arms. He even menaced imperial Rome. The pope, incapable of resisting his power, begged for peace, which was granted him on the humiliating conditions, that his holiness should surrender to the conquerors a great many pictures, and statues, and a multitude of curious MSS. from the Vatican. With these the general was for the present content: he retired from Rome, perhaps, however, desirous of some new causes to enable him to enrich his country with farther spoil. A pretence was soon given him. He had scarcely reached the boundaries of France, when he learned that the terms of the treaty had been wantonly broken by the subjects of his holiness. In the following year, 1797, he entered Italy again, and in one battle, well contested, decided the fate of the ecclesiastical

state. The banners of France now waved triumphant over the patrimony of the church. The pope was obliged to submit to whatever terms the conqueror should dictate. He agreed to the cession of Avignon, part of Venice, the cities and territories of Bologna, Ferrara, and Romagna: and to prevent the future power of the Roman pontiffs, the newly ceded territories, together with Reggio and Modena, were formed into one republic called the Cisalpine, and afterwards the Italian republic; while the Milanese, and other districts of Lombardy, were formed into another called the Ligurian republic. Thus the power and importance once annexed to the see of Rome were annihilated, and the influence of France in Italy established on the surest foundation. In 1801 the Italian republic was, at the desire of Bonaparte, divided into twelve departments. We have seen, under the article FRANCE, in what manner Bonaparte, as well by a train of fortunate circumstances, as by his talents, obtained the honours of a consulship, in imitation of the office held in ancient Rome; and how he advanced from step to step, till he was proclaimed "emperor of the French," with unlimited powers. This event occurred on the 2d of December 1805, when he swore in the presence of the pope (Pius VI.), whom he had brought to Paris to be the witness of his own humiliation, "to govern solely with a view to the interest, the happiness, and glory of the French nation." He boldly asserted, in the presence of all the principal personages then assembled, that he ascended the throne by the unanimous wishes of the senate, the people, and the army, whose happiness or misery had constituted, and would for ever constitute the sources of his own pleasures and pains. "My descendants," said he, "shall long preserve this throne. In the field, they will be the first soldiers of the army, sacrificing their lives for the defence of their country. As magistrates, they will never forget that contempt of the laws, and the confusion of social order, are only the result of the imbecility and uncertainty of princes." The splendour of this show was introductory to a similar display in Italy. He had before been regarded as the chief of the Italian republic; but the name of a republic probably carried with it ideas abhorrent to his heart, and the very word grated on his ears. In the month of April 1805, he assumed at Milan the title of "king of Italy:" in this city he placed the iron crown on his own head, while senators from almost all the ancient states were assembled as witnesses of his elevation, and their own degradation. On this occasion he related all that he had done as a conqueror and a great statesman; saying, that the power of the French empire had nevertheless been surpassed by the moderation which presided in its political transactions. "We had conquered," said he, "Holland, three-fourths of Germany, Switzerland, all Italy; but of so many provinces, we have only kept what was necessary to preserve us at the same point of consideration and power which France has always possessed. The partition of Poland, the losses sustained by Turkey, the conquest of the Indies, and almost all our colonies, had destroyed the balance of power to our disadvantage." He next recounted all his glorious deeds, and all his generosity with regard to Germany, Holland, and Switzerland; and adds, "The union of the Italian republic to the French would have been an advantage to our agriculture; nevertheless, after the second conquest, we, at Lyons, confirmed its independence. We now do more. We proclaim the principle of the separation of the crowns of France and Italy, by fixing for that separation the moment it can be done, and without danger to our people of Italy. We have accepted, and will place upon our head, the iron crown of the ancient Lombards, in order to re-temper and consolidate

it; so that it may not be broken by the shocks by which it will be threatened, as long as the Mediterranean continues out of its habitual state. But we do not hesitate to declare, that we will transfer that crown to one of our children, natural or adopted, the moment we are freed from alarms for that independence which we have guaranteed to the other states of the Mediterranean." Upon the return of the emperor to his own dominions, it was announced to him that the Ligurian senate was waiting for an interview upon very important business. Accordingly, on the 25th of May, an extraordinary sitting of the Ligurian senate was held, when it was decreed that Genoa, its territories, and dependencies, should be annexed to the French empire. In his speech on this occasion, the emperor, having dwelt much at large on the advantage which would accrue to the continent in general, and to Genoa in particular, from this addition to his own dominions, added, "I will realize your expectations; I will unite you to my great people. I shall thereby acquire additional means of rendering that protection more powerful, which I have always been disposed to extend to you. My people will with pleasure receive you. They know that at all times you have been friendly to their armies; and that you have assisted them with all your force, and with all your means. They find, moreover, in your territory, ports, and an increase of maritime power, which is necessary for the support of their lawful rights against the tyrants of the seas.—Doge, and gentlemen of the deputation of the senate, and people of Genoa, return to your native country: I shall be there ere long, and will confirm the union which you and my people are about to form." At this meeting of the Italian legislature, the emperor presented prince Eugene Beauharnois to them as his representative, and viceroy of Italy; saying, that he himself would take an early opportunity of visiting all the departments of his new kingdom, in order that he might become better acquainted with their various wants. Since that period, in consequence of the success attendant on the wars between France and Austria, which were terminated by the treaties of peace of Presburg and Vienna, the whole Venetian territory, which pertained to Austria, the county of Gorizia or Goritia, the city of Trieste, Carniola, with its dependencies on the gulf of Trieste, and all the territories lying on the right bank of the Save, from the point where that river leaves Carniola, along its course to where it touches the province of Bosnia, six districts of military Croatia, Fiume, the Hungarian Littoral, Austrian Istria, together with the islands dependent upon the ceded territory, were added to the Italian dominions of the new emperor and king. On the 20th of March 1811, Bonaparte had a son born by his present empress, the daughter of the emperor of Germany. To this son he instantly gave the title of "king of Rome," and required his ministers, and the chief persons under his direction, to render due homage to the infant in his cradle: thus shewing that he meant the prince Eugene, above noticed, only as his representative till one of his own children should be fitted to sway the sceptre of the Italian kingdom. Celarius's *Anc. Geog.* Univer. Hist. *Anc. and Mod. Geographies* of Pinkerton, Playfair, and Smith. Holberg's *Univer. Hist.* And Public Papers in the several volumes of the *New Ann. Register*.

In the fifteenth century, when we first hear of harmony in four parts, and masses set to figurative music, it was for the use of the pope's chapel that the greatest efforts of genius in composition were excited among the candidates for favour in that art, by the double certainty of having their labours liberally rewarded, and their productions well performed. And if we find that many of the composers of the pontifical

chapel were Netherlanders, and the singers Spaniards, it does not necessarily follow that the Italians had either counterpoint, or the art of singing, from the Low Countries, or from Spain. The Roman college of singers had been established and celebrated during so many ages, that we may as well imagine these foreigners went to Rome to *learn* music, as to *teach* it.

We know, in later times, that many of the greatest musicians of Europe have either had their education in Italy, or thought it as necessary to visit that country as the ancient Roman philosophers to travel into Greece, or the Grecians into Egypt. Orlando di Lasso, Handel, Hæssle, Gluck, and J. C. Bach, went thither very early, and may be said to have formed their styles on the best models of that country. The first motets of Orlando that were published at Antwerp, by Tylman Susato, 1555, were said to be made "*à la nouvelle composition d'auteurs d'Italie*;" as the first productions of Handel, that were published in England, were said to be composed "by an eminent *Italian* master;" Hæssle went very young into Italy, and was a scholar of Alessandro Scarlatti; however, his clear and graceful style more resembled that of Vinci and Pergolesi, his competitors in the natural, simple, and elegant manner of writing for the voice, than that of either Scarlatti, his master, or Kaifer, his countryman, and first model. The late excellent composer, Mr. J. C. Bach, son and brother of two of the greatest musicians that ever existed, is allowed to have been a fine player on keyed instruments, before he went into Italy; but his vocal music is certainly more in the style of Italy, than of his native country.

If the great musicians of antiquity, whose names are so familiar to our ears, had not likewise been poets, time and oblivion would long since have swept them away. But these having been luckily writers themselves, took a little care of their own fame; which their brethren of after-ages gladly supported for the honour of the *corps*.

But since writing and practical music have become separate professions, the celebrity of the poor musician dies with the vibration of his strings; or if, in condescension, he be remembered by a poet or historian, it is usually but to blazon his infirmities, and throw contempt upon his talents. The voice of acclamation, and thunder of applause, pass away like vapours; and those hands which were most active in testifying temporary approbation, suffer the same of those who charmed away their care and sorrows in the glowing hour of innocent delight, to remain unrecorded.

If it be true that the progress of music in every country depends on the degrees of civilization and culture of other arts and sciences among its inhabitants, and on the language which they speak, the accents of which furnish the skeleton and nerves of all vocal melody; great perfection cannot be expected in the music of Europe during the middle ages, when the Goths, Vandals, Huns, Germans, Franks, and Gauls, whose ideas were savage, and language harsh and insolent, had seized on its most fertile provinces. All the dialects that are now spoken in Europe are a mixture of Celtic and Latin; and as the inhabitants of Italy preserved the Roman language longer than those of other countries remote from the seat of empire, more vestiges of the Latin tongue still remain in Italy than elsewhere. For though there are many terms in it that they were forced to receive from the barbarians who invaded them, yet the chief part of the language is still Latin corrupted, and sometimes softened and improved. And as literature, arts, and refinements, were encouraged more early in Italy at the courts of the Roman pontiffs, than in any other country, modern music has thence been furnished with its scale, its counterpoint, its best melodies,

melodies, its religious and secular dramas, and with the chief part of its grace and elegance. Italy, in modern times, has been to the rest of Europe what ancient Greece was to Rome; its inhabitants have helped to civilize and polish their conquerors, and to enlighten the minds of those whose superior force and prowess had frequently enslaved them.

ITANBERA, a town of Brazil, in the government of Minas Geraes; 36 miles W. of Villa Rica.

ITANNA, or ESTENNA, a kingdom of Africa, on the Slave coast, subject to Benin.

ITAPE, a town of South America, in the province of Paraguay; 90 miles S.E. of Assumption.

ITAPUA, a town of South America, in the province of Paraguay, on the Parana; 170 miles S.E. of Assumption.

ITATA, a town of South America, in the country of Chili, on a river of the same name; 32 miles N.N.E. of La Concepcion.

ITATI, a town of South America, in the province of Buenos Ayres, on the Parana; 35 miles N.E. of Corrientes.

ITCH, in *Medicine*, a contagious disease of the skin, which is characterized by an eruption of numerous small pustules, more especially about the fingers, wrists, and the bending of the joints, accompanied by the most importunate itching, without fever.

This disease seems to have been included, together with the running, or moist tetter, under the appellation of *ulcerating psora*, (*ἡ ἀσθήνη*) of the Greeks, and constituted one form of the *scabies* of the Latin writers. In the writings of the moderns, it is sometimes denominated *psora*, but more frequently *scabies*; the term *psora*, indeed, when used by the Greeks without any epithet, signified the scaly tetter, which is analogous to their *lepra*, (see Willan on Cutaneous Diseases, Order ii. Genus 2.) and not a pustular disease.

The eruption of scabies begins most commonly on the limbs, and especially about the wrists and fingers, in the form of minute pustules or watery pimples, which are accompanied by a sensation of violent itching, which is greatly increased by external warmth, and therefore is particularly troublesome soon after the patient gets into bed. It assumes, however, a considerable variety of forms, in different instances, and even in different stages, of the complaint, which the vulgar have noticed, and distinguished by particular appellations. What they denominate the *rank itch*, is often seen early in the progress of the disorder, or in mild cases; and consists of a numerous crop of pimply eruption, which spreads over the whole body, arms, breast, and lower extremities; but, on the trunk of the body especially, the characteristic ichorous pustule commonly appears here and there intermixed with the papulæ, and the final tendency of the eruption is to the pustular form. In other cases, large watery vesicles are seen diffused over the thighs, arms, hands, and region of the stomach; in which case the disease is popularly termed the *watery itch*. And not unfrequently the eruption over the arms, wrists, and fingers, consists of large, yellow pustules, which become confluent, and form cruits or scabs as the matter dries; this has been termed the *pocky itch*, not from its connection with any syphilitic contagion, as some have been led to imagine from the term; but from the resemblance of the pustules to those of the distinct small-pox. Some writers have mentioned a *scorbutic itch*, and have included the pustular syphilitic eruptions under the term *itch*; but these eruptions, as well as the affections of the skin originating from the true scurvy, differ essentially from *scabies*

in their form, and in the absence of that incessant and importunate itching, which accompanies the latter. The term *scorbutic itch* has sometimes been applied to the *prurigo*, it would seem, when it was accompanied by a particularly irritable and inflamed state of the skin.

The pruriginous eruptions, indeed, which Dr. Willan has described as consisting of pimples, which do not become pustular in general, or discharge any fluid, even when the tops are rubbed off, after continuing some time, are apt to become pustular and contagious; that is, to degenerate into *scabies*, if they are long neglected, or where cleanliness is not sufficiently attended to. And there is an eruption, which is not very uncommon, partaking, in its appearances, of the character of *prurigo* and *impetigo* conjoined, which is contagious in its double character, and exceedingly obstinate. In work-houses, moreover, a virulent scabies is often seen, which appears to be a mixture of the poison of *porrigo* with that of itch, and which affects the whole body, with scabby and itching ulcerations, that are communicated by the contagion, under the same form. In short, it is extremely difficult to point a certain diagnosis of the *scabies*, from the variety of forms under which a contagious and pustular eruption appears, under different circumstances. See PRURIGO.

The itch is most frequently communicated from one person to another by contagion, that is, by actual contact; as by sleeping, shaking hands, &c. with a person affected, or by using the clothes, linen, &c. which had been previously used by such a person. But in some cases it seems to originate in individuals, who neglect or do not possess the proper means of cleanliness, and in others is the result of the conversion of the papulous diseases (the lichen and prurigo of Dr. Willan's arrangement) into a pustular disease. When the complaint is communicated by contact with the person or clothes of one already infected, it is doubtless commonly conveyed by a sort of inoculation of the ichorous or purulent matter, discharged from the pustules. Some, however, have attributed the disease itself, as well as the ready propagation of it, to the existence of certain minute insects, which breed in the furrows of the cuticle, and which are conveyed from one person to another by such intercourse as we have just mentioned. Bonomo, an Italian physician, was one of the first to describe this insect, and his account was made known in England by Dr. Mead. (See *Philos. Trans.* vol. xxiii.) It has been since called the *acarus scabiei*, and has been particularly described and figured by Degeer (*Hist. des Insectes*), and others. Linnaeus considered it the same with the *acarus* or mite, which breeds in flour; but Degeer has shewn this to be a mistake. These insects, which we confess we have never been able to detect in any case of scabies, are said to be found, not in the large pustules, but in the recent watery pustules, or still more commonly in the furrows of the cuticle, near them, on the hands and fingers.

Cure.—A great variety of remedies have been employed at different times for the cure of this filthy complaint; and in general, indeed, it is not very difficult of cure, although the remedy is also filthy like the disease. Sulphur, both taken internally, in combination with some neutral or alkaline salt, and applied externally over the parts affected, in the form of an ointment, is found to be the most certain and efficacious remedy. The white hellebore, applied either in an ointment, or in a strong decoction as a lotion, has considerable influence over the disease; and some of the preparations of mercury, such as the white precipitate, the oxy-muriate, or corrosive sublimate, &c. as well as the muriate of ammonia, potash in a state of a deliquescence, &c. are also occasionally resorted to, in various combinations, with success.

success. A number of other medicines, both external and internal, are recommended by the older writers, especially the juices and decoctions of several roots and plants; but it seems altogether unnecessary to enumerate them, since recent experience has decided upon the superior efficacy of the remedies just mentioned. See Turner on Dis. of the Skin. Callisen. Syft. Chir. Hodeira. § 824. Sauvages, Nofol. Meth. Clafs x. Gen. 28.

ITEN Animal, a creature said to be found in the pustules of the itch; it is a species of acarus.

ITCHAPOUR, in *Geography*, a town of Hindooftan, in the circar of Ellichpour; 48 miles S.S.W. of Ellichpour. N. lat. 20° 28'. E. long. 77° 38'.—Also, a town of Hindooftan, in the circar of Cicacole; 30 miles S.S.W. of Ganjam.

ITCHAUR, a town of Hindooftan, in the circar of Hindia; 30 miles N. of Hindia.

ITCHE, a town of Thibet; 95 miles S.W. of Chatcheu.

ITCHING RIVER, in Hampshire, is navigable for barges up to Winchester city, of which an account has been given in our article *CANAL*: since which, there have been attempts, and one is now making, for obtaining an act for further improving this navigation. About 1802, a bridge was built over this river at Northam. At Wood mills, on this river, ships' blocks are manufactured by machinery, but in a manner far less complete and ingenious than the block machines by Mr. Brunell, which are erected in the dock-yard at Portsmouth, of which we intend to give some account under our article *Block MACHINERY*.

ITCHORSKA, a town of Russia, in the government of Irkutik, on the Lena; 80 miles N.E. of Kirensk.

ITEA, in *Botany*. *ITEA* of the ancient Greeks is a general appellation for willows or fallows, as appears from Theophrastus and Dioscorides. The word is derived from *ιτα* *ιτα*, alluding to their quick growth, or early germination.—Linnaeus applied the name to this North American genus from its willow-like aspect.—Linn. Gen. 109. Schreb. 150. Willd Sp. Pl. v. 1. 1146. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. ed. 2. 37. Juss. 159. Lamarck Dict. v. 3. 314. Illustr. t. 147. (Cyrilla; Linn. Mant. 50. Syft. Veg. ed. 14. 241. Schreb. 150.) Clafs and order, *Pentandria Monogynia*. Nat. Ord. *Bicornes*, Linn. *Rhododendra*, Juss.

Gen. Ch. Cal. Perianth of one leaf, erect, very small, permanent, divided into five acute, coloured segments. Cor. Petals five, lanceolate, long, inserted into the calyx. Stam. Filaments five, awl-shaped, erect, the length of the corolla, inserted into the calyx; anthers roundish, incumbent. Pist. Germen superior, ovate; style cylindrical, permanent, as long as the stamens; stigma obtuse. Peric. Capsule ovate, much longer than the calyx, terminated by the style, of two cells, and two valves with inflexed edges, gaping at the top. Seeds numerous, very small, oblong, shining.

Ess. Ch. Petals long, inserted into the calyx. Capsule of one cell, and two valves.

Obf. L'Heretier has the honour of having first declared the *Itea* and *Cyrilla* of Linnaeus to be one and the same genus, from the conformity of the flower, and two-celled fruit of each.

i. *I. virginica*. Linn. Sp. Pl. 289. Trew. Ehret. 55. t. 98.—“Leaves ovate, acute, serrated.”—A native of North America, flowering from June to August.—This shrub rises to the height of five or six feet. Its stem is branched all the way up. Leaves slightly serrated, reflexed, light green. Flowers white or yellowish, composed of numerous spikes three or four inches long.—Linnaeus remarks that this species is very similar in appearance to *Prunus Padus*, the Bird-cherry.

2. *I. Cyrilla*. Willd. n. 2. L'Herit. Stirp. fasc. 6. 137. t. 66. (Cyrilla racemiflora; Linn. Mant. 50. Jacq. Ic. Rar. 1. t. 47.)—“Leaves lanceolate, entire, membranaceous.”—A native of Carolina. It flowers in July and August.—Root perennial. Stem sparingly branched, round, ash-coloured. Leaves alternate, bluntish, rather undulated; their foot-stalks reddish. Clusters numerous, lateral, from four to six inches long. Flowers scattered, white; anthers pale-violet coloured; germen whitish.

ITEA, in *Gardening*, contains plants of the hardy, deciduous, shrubby kinds, of which the species mostly cultivated are, the Virginian itea (*I. virginica*); and the entire-leaved itea (*I. cyrilla*).

Method of Culture.—The first sort is capable of being increased by layers, which should be laid down in the autumn, when they will put out roots so as to be fit to take off by the following autumn, when they may be removed into the nursery, or the places where they are to grow. It does not succeed well on dry gravelly soils.

It is also capable of being raised from seed, by sowing it in the spring, as soon as procured from abroad.

The second species may be increased by layers or cuttings, planted in pots of good mould in the spring; in the latter case, placing them in a mild hot-bed, till they have stricken root, afterwards removing them into separate pots, placing them in airy situations in the green-house or other proper place.

Plants of the first kind are very ornamental in the borders and clumps, and those of the latter among green-house collections, or those in other protected places.

ITENG, in *Geography*, a small island in the East Indian sea. S. lat. 6° 42'. E. long. 132° 15'.

ITERATION. See *REITERATION*.

ITERI, in *Geography*, a town of the island of Sardinia.

ITFU, a town of Egypt; 8 miles S. of Tahta.

ITHACA, a town of New York, at the southern extremity of lake Cayuga; 30 miles S. of Cayuga. N. lat. 42° 27'. W. long. 76° 33'.

ITHACA, in *Ancient Geography*, one of the Greek islands, situated in the Ionian sea, between Dulichium and Capaleneis, famous for being the birth-place of Ulysses, the son of Laertes. It had the advantage of a town and a good port: it is now called “Theaki,” and its port “Vahti.” Its circuit is reckoned about 40 miles. Some ruins still remain, which tradition reports to have been part of the palace of Penelope.

ITHCYPHOS, in *Surgery*, curved or deformed in the back.

ITHOME, in *Ancient Geography*, a town of Messenia, north of Messene, so called from the mountain on which it was erected and well fortified, being encompassed with a stone wall. In it was a statue of Jupiter the “Saviour,” and also a fountain called Arsinoe, which was supplied with water from another fountain called Clepsydra. Neptune and Venus had each of them a temple in this place; and the mother of the gods had a superb statue of Parian marble. This town contained also a temple dedicated to Messenê, daughter of Triopas, whose statue was formed partly of gold and partly of the marble of Paros. It had likewise a temple, in which were deposited and preserved the victims appropriated to the sacrifices. Besides, it was adorned with all the statues of the gods which were worshipped in Greece. It had a theatre which had been a temple dedicated to Serapis and Isis. The citadel was constructed on the summit of the mountain, and at the gate by which they passed to Megalopolis was a statue of Mercury.

Jupiter.

Jupiter was worshipped in this place under the appellation of "Ithomatus" by the people of Messenia: and as they pretended that he had been educated in their country, they appropriated to him a peculiar worship; and while the festival, called "Ithomæa" lasted, they were accustomed to carry water during the whole day from the fountain Clepsydra into his temple. Games accompanied this festival, and also trials of skill on various instruments of music. Pausan. in Messen.

ITHYNTERION, Ἰθυντήριον, in *Antiquity*, a staff of laurel, which prophets usually carried in their hands, otherwise called *sceptron*.

ITHYSCOLIOS, in *Surgery*, an oblique curvature of the spine.

ITINERANT JUDGES, or *Justices*, such as were formerly sent with commissions into divers counties, to hear chiefly those causes called *pleas of the crown*: the same with what are otherwise called *justices in eyre*. See *JUSTICE*.

ITINERARIUM, in *Surgery*, a name given by Hildanus, and many other writers, to a staff used in the operation of cutting for the stone.

ITINERARY, the description a traveller gives of the course of his journey, and of the curiosities, &c. he observed therein.

The Itinerary of Antonine shews all the grand Roman roads in the empire, and all the stations of the Roman army. It was drawn up by order of the emperor Antoninus Pius; but is now very defective, having suffered much under the hands of the copyists and editors.

ITINERARY Column. See *COLUMN*.

ITING, in *Ornithology*. See *GRACULA Calva*.

ITIOBARA BAY, in *Geography*, a bay on the coast of Brazil. S. lat. 6° 20'. W. long. 37° 46'.

ITIUM PROMONTORIUM, in *Ancient Geography*, a promontory of Gaul, mentioned by Ptolemy, and supposed to be at the mouth of the Somme, in France, and extending towards the north. According to D'Anville it is Grifsnès.

ITIUS PORTUS. See *ICCIUS Portus*.

ITKARINSKOL, in *Geography*, a town of Russia, in the government of Kolivan; 156 miles E.N.E. of Kolivan. N. lat. 55° 36'. E. long. 85° 44'.

ITONA, in *Ancient Geography*, a town of Epirus.—Also, a town of Italy.—Also, a town of Asia Minor, in Lydia.—Also, the name of two places, one in Bœotia, the other in Lydia.

ITORUM URBS, a town of Italy, on the route from Otricoli to Rimini, near the mountains; mentioned by Strabo.

ITRABO, in *Geography*, a town of Spain, in the province of Granada; 10 miles W.N.W. of Motril.

ITRI, a town of Naples, in the province of Lavora; 3 miles S.E. of Fondi.

ITSJA, a town of Japan, in the island of Ximo; 10 miles N. of Taifero.

ITTENDAL, a town of Sweden, in the province of Helplingland; 15 miles N. of Hudwickfval.

ITTERGAU, a fertile district of Upper Hesse, watered by the Itter, which runs into the Eder, two miles S.W. of Vohle.

ITTER-THAL, ITER-EN-VAL, or *Bergstadt*, a town of Upper Hesse; 24 miles W. of Cassel.

ITTIGIUS, THOMAS, in *Biography*, who flourished in the seventeenth and eighteenth centuries, was born at Leipzig about the year 1654. Here he pursued his studies, and was afterwards appointed assessor of the faculty of philosophy at the same place. Being admitted to the ministry, he discharged the duties of that office in different churches in

that city. In 1686, he was admitted to the degree of doctor of divinity, and in the following year he was appointed first professor extraordinary in that faculty, and then professor in ordinary. He took a considerable share in publishing the "Leipsc Acts," and besides other employments, filled the post of superintendent of the ecclesiastical district of that city. He died in 1710: and was author of "A Treatise on Burning Mountains;" "Dissertatio de Hærearchis Ævi Apostolici, eique proximi;" "Prolegomena ad Josephi Opera," and many other works, which were highly esteemed by his contemporaries. Lardner, in his seventh vol. speaks of him as the very learned Ittigius. The same author refers to his opinion in other places. Moreri. Lardner.

ITU, in *Geography*, a town of South America, in the province of Buenos Ayres, on the Parana; 130 miles E. of Corrientes.

ITUCI, in *Ancient Geography*, a town of Hispania, in Bætica, a little south of Cadulo, and north of Eliberis; called by Pliny "Virtus Julia."

ITUERO, in *Geography*, a town of Spain, in the province of Leon; 13 miles S.S.W. of Ciudad Rodrigo.

ITUNA, in *Ancient Geography*, an estuary of Britain, which is unquestionably the Solway Firth, which now divides England from Scotland on the west side.

ITUREA, a province of Asia, so called from Itur, the son of Ishmael, sometimes erroneously called Jetur. It was situated on the other side of Jordan, on the N. side of the half-tribe of Manassah, between that and the territories of Damascus; so that it made one part of Cœlesyria, and lay on the side of Judæa, as Idumæa lay on the other. The Itureans were famous for drawing the bow, but they were a fierce people. Iturea was invaded by Aristobulus, who succeeded his father Hyrcan; but being taken ill in the midst of his successes, he was under a necessity of being brought back to Jerusalem, and to leave his brother to complete the conquest of that province; an achievement which he soon accomplished, causing all the Itureans, either to be circumcised and incorporated with the Jews, or else to depart into some other country.

ITURISSA, a town of Hispania, in the country of the Vascones. Ptol. In the Itinerary of Antonine it is placed 18 miles from the Pyrenees.

ITWA, in *Geography*, a town of Bohemia, in the circle of Pilsea; 3 miles N.W. of Teufing.

ITYCA, in *Ancient Geography*, a town of Africa, in Lybia, which was a colony of Tyrians.

ITYPHALLOPHORI, in *Ancient Mythology*, attendants on the orgies of Bacchus, who accompanied the Phallophori, habited like fawns, counterfeiting persons drunk, and singing, in honour of Bacchus, songs suitable to their functions. See *ORGES*.

ITYS, in *Ancient Geography*, one of the rivers of Britain, which runs into the sea opposite to the isle of Skye.

ITZEHOE, in *Geography*, a town of the duchy of Holstein. This town has a very ancient origin: it is named from a fortress built in the beginning of the ninth century by order of Charles the Great, issued in 809, to repel the incursions of the Danes into Germany. This fortress was called Esseho, or Isseho. In process of time it was surrounded by a number of houses, which, about the middle of the 13th century, obtained the privileges of a town. It has since been several times destroyed; but is now a small, agreeable, and well built town, partly situated on the river Stöer, which runs into the Elbe, and has been erroneously mentioned by some travellers as a canal cut from that river. It is distant from Hamburgh 47 miles, and 12 from Gluckstadt. The church, which is in the market-place, is very

very small, but the steeple is high, of a particularly light architecture: it stands on four small iron pillars, which, at a distance, are hardly perceivable. N. lat. $53^{\circ} 57'$. E. long. $9^{\circ} 35'$.

IVA, in *Botany*, a name apparently of barbarous origin, first applied to a species of *Teucrium* or *Ajuga*. It does not appear why Linnæus appropriated it to the present genus. —Linn. Gen. 490. Schreb. 637. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 346. Juss. 190. Lamarck Dict. v. 3. 315. Illustr. t. 766. Gærtn. t. 164. (*Tarchonanthus*; Vaill. Act. 1719. f. 16, 17.)—Class and order, *Monocladia Pentandria*. Nat. Ord. *Composite Nucamentaceæ*, Linn. *Corymbifera*, Juss.

Gen. Ch. Common Calyx roundish, of about five sub-ovate, obtuse, nearly equal, permanent leaves, containing many florets. Cor. Compound convex, having numerous male florets in the disk, and five female ones in the circumference; that of each of the males monopetalous, funnel-shaped, five-toothed, the length of the calyx; of the females wanting. Stam. Filaments five, setaceous, the length of the floret; anthers erect, approximated. Pist. Germen oblong, the length of the calyx; styles two, capillary, long; stigmas acute. Peric. none, except the unchanged calyx. Seeds solitary, naked, as long as the calyx, thicker about the upper part, obtuse. Recept. beset with linear scales.

Ess. Ch. Male, Common calyx of three or five leaves. Florets of the disk monopetalous, five-cleft. Female, Corolla wanting. Styles two. Seeds naked, obtuse.

1. *I. annua*. Linn. Sp. Pl. 1402. Schmid. Ic. 59. t. 16. "Leaves lanceolate, ovate. Stem herbaceous."—A native of South America.—This annual rises to the height of five or six feet. Root fibrous, branching. Stem jointed, furrowed, red, hairy; pairs of opposite branches formed at each joint. Leaves opposite, on foot-stalks, ovate and pointed, veined, reddish above, and green underneath. Clusters axillary and terminal, blueish, or of the same rusty colour with the stem, interspersed with long, pointed, serrated bractæas.

2. *I. frutescens*. Linn. Sp. Pl. 1402. (*Elichryso affinis peruviana frutescens*; Pluk. Phyt. t. 27. f. 1.)—"Leaves lanceolate. Stem shrubby."—Found in Virginia and Peru. It flowers in August.—Root perennial. Branches woody, slender, eight or ten feet long. Leaves serrated; the branches terminated by clusters of pale purple flowers.

IVA, in *Gardening*, comprises plants of the hardy, deciduous, shrubby, herbaceous, annual kinds, of which the species commonly grown are, the annual iva (*I. annua*), and the shrubby iva, or bastard Jesuit's bark-tree (*I. frutescens*.)

Method of Culture.—The plants of the first sort are raised by sowing the seeds on a moderate hot-bed in the spring, and when they are fit to remove, placing them in another hot-bed, treating them as the less tender annual sorts.

But in the second sort, the young branches should be laid down in the spring, when they will put out roots in about six months; or cuttings may be planted in a shady border in May, and when they have taken root, removed, with earth about their roots, to the places where they are to grow. The plants succeed best in a dry soil, and warm sheltered situation.

Plants of the first sort afford ornament among the less tender annuals, and those of the latter in the warm borders and clumps in shrubberies and pleasure ground.

IVAFUNE, in *Geography*, a town of Japan, in the island of Niphon; 30 miles S.S.E. of Nigata.

IVAHAIH is the name of one of the canoes or boats used

by the islanders of the South sea, for short excursions to sea: it is wall-sided and flat-bottomed. See BOAT.

IVAN I., VASSILIEVITCH, JOHN BASILOWITZ, in *Biography*, czar of Russia, was born in 1438, and succeeded to the throne in 1462. At this period Russia was divided into a number of petty principalities: some of them were subject to the czar or great duke, and all, together with him, tributary to the Tartars, who assumed a superiority over that prince. The following is given as an instance of the fervitude of the great duke. It is recorded by Crompton the Polish historian, and quoted by Coxe in his travels: "Whenever the Tartar ambassadors were sent to Moscow to collect tribute, the great duke used to meet them, and offer, as a mark of his respect, a cup of mare's milk; and if a drop chanced to fall upon the mane of the horse on which the Tartar ambassador was sitting, he would himself lick it up. When they reached the hall of audience, the ambassadors read the khan's letter seated upon a carpet of the choicest furs, while the great duke with his nobles knelt, and listened in respectful silence." Ivan, who may be justly esteemed the founder of Russian greatness, was a man of gigantic stature, and of corresponding resolution and vigour, accompanied with the ferocity of a barbarian despot. In the course, however, of a prosperous reign of above 40 years, he gave a new aspect to the Russian affairs: he annexed to his dominions several neighbouring principal duchies, subdued Novogorod, and rescued his country from the Tartar yoke. He had no sooner delivered Russia from this dependence, than his alliance was courted by many European sovereigns, and during his reign, for the first time, the emperor of Germany, the pope, the grand signior, the kings of Poland and Denmark, and the republic of Venice, felt it their interest to send ambassadors to the Russian court. The talents of Ivan were not confined to military affairs. Russia was indebted to him for the improvement of her commerce, and for opening a more ready communication with European nations. Under his auspices, the knowledge of gunpowder, and the art of casting cannon were first brought into Russia by Aristotle of Bologna: he employed the same artist, and some other foreigners, to re-coin Russian money, which had hitherto been disfigured by Tartar inscriptions: he engaged, at a vast expence, Italian artists to enclose the citadels of Moscow and Novogorod, with walls of brick, and to erect several churches and other public structures with the same materials. For his various services he obtained the title of *Great*. It should be observed, that the manners of Ivan were softened and polished in some degree by the example of his second wife Sophia, a Grecian princess, daughter of Thomas Palæologus, a lady of consummate beauty and winning address, who, to all the softer graces of her sex, added a vigorous and manly spirit, and who, while she infused into her husband a taste for the arts of peace, animated him to those glorious enterprises which occasioned the aggrandisement of his country. He is represented as being stern and unfeeling, given to ebriety, though he punished it severely in others, and an object of dread to all who approached him. He died in 1505, in the 67th year of his age, and the 43d of his reign. On each side of his remains were deposited those of his father, Vassili Vassilievitch, and of his son, Vassili Ivanovitch, who succeeded him on his throne, and expired in 1533. Coxe's Travels, vol. ii.

IVAN II., VASSILIEVITCH, succeeded his father Ivanovitch in the year 1530. Being only three years of age, he was left under the care and superintendence of guardians, who faithfully performed the duty committed to them, and defeated the plots of the young prince's uncles, who were

desirous of depriving him of his crown. At the age of 19 he sent a splendid embassy to the emperor Charles V. the chief purpose of which was to obtain from Germany proper persons to assist him in the civilization of his subjects, and in introducing arts and manufactures. More than 300 artisans, of all professions, actually arrived at Lubec in their way to Moscow, but were prevented from proceeding on their journey by the intrigues of the inhabitants of that town. Ivan II. raised the superstructure of the Russian grandeur, of which his grandfather had laid the foundation. He instituted a standing army, trained his soldiers to the use of fire-arms, and accustomed them to a more regular discipline. By means of this formidable body, he extended his dominions on all sides, conquered the kingdoms of Kasan and Astracan, and rendered the Russian name respectable to the distant powers of Europe. He gave to his subjects the first code of written laws; he introduced printing into Russia; he promoted commerce, and regulated all the duties connected with it. While involved in a war with the Poles, a domestic conspiracy, in 1566, occasioned by his tyranny, threatened to deprive him of his crown. Such was the danger, that he thought it best to make a feigned abdication. This produced the proposed effect of awakening the dormant loyalty of the people; but as soon as he had resumed the reins of government, he put to death the leaders of the conspiracy, and secured himself against any future rebellion, by the institution of a body of guards drawn from the remote provinces, and attached solely to himself. These he augmented, till at length they proved ready instruments of despotism. He entered into a friendly intercourse with queen Elizabeth of England, to whom he proposed an alliance offensive and defensive. Though the queen did not agree to his proposal in its full extent, yet a treaty was made, which was the commencement of the intercourse which has since subsisted between the two nations. In an invasion of Russia by the Poles, the city of Novogorod incurred the suspicion of having, by its principal inhabitants, held a correspondence with the king of Poland. This defection was punished in the most barbarous manner by the czar, who, in the course of a few weeks, adjudged several thousand persons to death. In 1571, after Russia had been desolated by the plague, the Crim Tartars, infligated by the Poles, made an irruption into the southern provinces, and advancing towards Moscow, entirely defeated the Russian army, which made a stand within 18 leagues of the capital. Ivan, upon the news, shut himself up in a fortified cloister, with his two sons, and most valuable effects, and by this cowardly desertion, allowed the Tartars to enter Moscow, which they plundered and burnt, with a vast destruction of the inhabitants. The czar's most formidable enemy was Stephen Battori, king of Poland, who, with the king of Sweden, declared war against Russia in 1579, took Narva and Riga, and became masters of the whole of Livonia. The Russians murmured at his conduct, and some of the nobles ventured to make remonstrances against his suffering foreign enemies to ravage the country, and requested that he would permit his eldest son to appear at the head of the army. The czar, suspecting that the prince had urged the nobles to this step, reprimanded him in very severe terms; and he attempting to justify himself, the father's anger was roused to such a pitch, that he gave him a violent blow with a staff tipped with iron, which laid him at his feet, and which in four days proved fatal. The savage monarch, who did not probably intend his son's death, passed from the extreme of anger to that of sorrow: he refused to take food or change his dress for several days, and endeavoured to expiate the deed by a magnificent funeral. An unsuccessful

attempt to chastise the Tartars, who had made a new incursion into the Russian territories, was the last act of this reign. He negotiated with them and returned to Moscow, when the approach of his own death awakened in him a desire of conferring benefits on his people. He now endeavoured to correct abuses introduced by his long wars, performed many acts of clemency, enjoined his successor to liberate prisoners, repeal taxes, and redress the injuries which his brutality had inflicted. He expired in 1584, in the 54th year of his age. He has been reckoned among the great monarchs of his country, on account of his spirited and successful attempts to free it from a foreign yoke, and to introduce arts and civilization. He left two sons, of whom Feodor or Theodore succeeded him.

JUAN, GEORGE, in *Biography*. See the article DEGREE for an account of this naval commander, eminent for his mathematical knowledge and skill in practical astronomy.

JUAN, *St.* in *Geography*, one of the Cape Verde islands. See BRAVA.—Also, the capital of California. N. lat. 26° 25'. W. long. 114° 9'.—Also, a town of Mexico, in New Biscay; 75 miles S.S.W. of Paral.—Also, a town of South America, in the province of Panama, between Panama and Porto-Bello.—Also, a sea-port town of Mexico, in the province of Nicaragua; 30 miles S.E. of Leon. N. lat. 12° 10'. W. long. 87° 38'.—Also, a town in East Florida; 12 miles N. of St. Mark.—Also, a small island in the North Pacific ocean, near the coast of New Albion, between the islands of St. Clemente and St. Diego.—Also, a town on the W. coast of the island of Lugon. N. lat. 17° 12'. E. long. 120° 48'.—Also, a town of South America, in the province of Moxes; 70 miles E.N.E. of Trinidad.—Also, a town of Paraguay; 270 miles S.S.E. of Assumption.—Also, a river of New Mexico, which runs into the gulf of California, N. lat. 29° 10'.—Also, a river of Spanish North America, in the province of Nicaragua, which forms an outlet for the lake of Nicaragua to the gulf of Mexico. It has been proposed to make use of this river in order to open a communication between the Atlantic and Pacific ocean. It is said to be navigated by the Indians through its whole course, and was reported in the reign of Charles V. to be as considerable as the Guadalquivir at Seville. The length of the river St. Juan is by the latest English maps about 100 miles; and it is navigated by large flat-bottomed boats and canoes, laden with tallow and other effects, which they carry to Porto-Bello, at the distance of 80 leagues; but they are obliged to unload at three places, probably rapids, where canals would be required. At one of these, the castle of our lady, called by the English the fort St. Juan, is placed on a rock, and though small, strong enough to protect the entrance. It has 36 cannons and a battery; level with the water is a platform, and towards the land it is defended by a ditch and rampart, reaching to the river. The usual garrison is 100 men, besides 16 of artillery, 40 musqueteers, and 20 militia; which last manage the barks, two being placed every night up and down the river. There are 18 slaves, male and female, for the service of the garrison, which is supplied with provisions, flesh, fowls, garden stuff, maize, and other articles, from the city of Granada, at the distance of 60 leagues; and there are always provisions for six months. But the climate is unhealthy, as it rains almost perpetually, and a recruit of 50 men from the capital, Guatemala, is necessary to supply the places of those who die. This fortress is regarded as the key of New Spain and Peru; and by seizing it, and the port of Realejo, an enemy would become master of both oceans. Such is the account of Alcedo, cited by Pinkerton in the 3d volume

of his Geography, to which we refer for some further particulars relating to the projected passage by the lake of Nicaragua between the two fore-mentioned oceans.—Also, a town of South America, in the Audience of Quito; 15 miles N.W. of St. Joachim de Omaguas.—Also, a river of Popayan, which runs into the Pacific ocean, N. lat. $3^{\circ} 32'$.

JUAN Battista, St., a town of South America, in the province of Chiquitos; 250 miles E.S.E. of Santa Cruz de la Sierra la Nueva.—Also, an island in the Pacific ocean, discovered by Quiros in 1606. S. lat. 26° . W. long. 149° .

JUAN de Buenavista, a town of the island of Cuba, on the N. coast. N. lat. $22^{\circ} 2'$. W. long. $77^{\circ} 57'$.

JUAN Capistrano, St., a Spanish settlement and mission in New Albion, formed in 1776; situated in a small cove on the Pacific ocean.

JUAN de Cinaloa, St. See CINALOA.

JUAN de Dios, St., a town of New Navarre; 240 miles W. of Casa Grande.

JUAN Fernandes. See FERNANDES.

JUAN de la Frontera, or *de la Cordillera*, a town of Chili; 120 miles N.N.E. of St. Yago. In its neighbourhood are gold mines. S. lat. $33^{\circ} 25'$. W. long. $68^{\circ} 55'$.—Also, a district of South America, lying to the east of the Andes, with a town of the same name; called also Chacapoyas.—Also, a town of Peru, and capital of a jurisdiction in the diocese of Truxillo. S. lat. $6^{\circ} 12'$. W. long. $77^{\circ} 28'$.

JUAN de Fuca, Straits of, a large bay or gulf of the North Pacific ocean, on the W. coast of North America. In 1792 captain Vancouver gave it the name of the gulf of *Georgia*, which see. Its entrance lies in N. lat. $48^{\circ} 25'$. W. long. $122^{\circ} 55'$.

JUAN de Goava, St., a town of the island of Hispaniola; 80 miles N.W. of St. Domingo.

JUAN de Nova, two small islands in the Indian sea. S. lat. $10^{\circ} 20'$. E. long. $52^{\circ} 45'$.

JUAN de los Llanos, St., or *San*, a province of South America, in New Granada, which forms a considerable district, if it be extended as far as the Orinoco; but as the capital town is on the western skirts, the extension given by La Cruz seems very arbitrary, there being no Spanish settlement in that direction. This territory consists of prodigious plains, extending for 2 or 300 leagues. The town was founded in 1555, and was formerly celebrated for gold mines, which have now declined; and the inhabitants scarcely exceed 50; 50 miles E.S.E. of Santa Fé de Bogota. N. lat. 3° . W. long. $73^{\circ} 26'$.

JUAN del Oro, St., or *Carabaya*, a town of Peru, and capital of a jurisdiction, in the viceroyalty of Buenos Ayres, and diocese of Cusco; 150 miles S.E. of Cusco. N. lat. $14^{\circ} 40'$. W. long. $69^{\circ} 36'$.

JUAN de Pasto, St. See PASTO.

JUAN de Porto Rico, St., a town and capital of the island of Porto Rico, situated on a peninsula in the N. coast of the island, having a good harbour, defended by a citadel and castle; populous and well built, the see of a bishop, and residence of the governor. The town was founded in the year 1514; but in 1594, when it was in a flourishing state, it was attacked by sir Francis Drake, who destroyed all the ships in the harbour, but could proceed no farther. In 1597 it was taken and plundered by the earl of Cumberland. N. lat. $18^{\circ} 30'$. W. long. $66^{\circ} 20'$.

JUAN del Rey, St., a town of Mexico, in the province of Guaxaca; 25 miles N. of Guaxaca.

JUAN Rio, a town of the island of Cuba; 26 miles E.S.E. of Spiritu Santo.

JUAN d'Ulva, St., a small island in the gulf of Mexico, near the coast of Tlascala, at the mouth of the river Vera

Cruz. On this little island is a fortress to defend the entrance into the harbour of Vera Cruz.

IVANGOROD, a town of Russia, in the government of Petersburg, on the Plussa, near the Baltic, opposite Narva, built by Ivan Basilowitz; surrounded by a treble wall, and defended by a number of small towers: 52 miles S.W. of Petersburg. N. lat. $59^{\circ} 16'$. E. long. $28^{\circ} 14'$.

IVANITS, a town of Croatia, on the river Lonia; 42 miles N.E. of Carlstadt. N. lat. 46° . E. long. $16^{\circ} 44'$.

JUANNA. See HINZUAN.

IVAPECANGA, in *Botany*, a name given by some authors to the climbing plant, of which the *santaparilla*, used in medicine, is the root.

JUAR, in *Geography*, a town of Hindoostan, in the subah of Delhi; 17 miles S. of Secundara.

JUBA I., in *Biography*, king of Numidia, the son of Hiempsal, a descendant of Massinissa, favoured the cause of Pompey against Julius Cæsar. He defeated Curio, one of Cæsar's lieutenants, in Africa, who perished in the action; and after the battle of Pharsalia he united his forces to those of Scipio. They were joined by Cato, who repressed the pride of Juba, by preventing him taking place above Scipio. He was conquered in a battle at Thapsus, and was totally abandoned by his subjects. Seeing that all was lost, he killed himself, as did Petreus, who had shared his good fortune and his adversity. His kingdom became a Roman province, of which Sallust was the first governor.

JUBA II. king of Mauritania, son of the preceding, being very young at the time of his father's death, was led as a captive in Cæsar's triumph. The conqueror requited him for this act of humiliation by affording him the advantages of an excellent education, in consequence of which he became one of the most learned men of his time, and attained a conspicuous place as an author, by which he attained to more glory than he could have derived from the inheritance of a kingdom. He gained the hearts of the Romans by the courteousness of his manners, and Augustus rewarded his fidelity by giving him in marriage Cleopatra, the daughter of Antony, by conferring upon him the title of king, and making him master of all the territories which his father once possessed. Juba governed his dominions with a spirit of justice and lenity which gained him the esteem of his subjects. He distinguished himself as a writer by various learned works, which related to the history and antiquities of the Arabians, Assyrians, and Romans. He wrote also the history of theatres, of painting and painters, of the nature and properties of different animals, and a particular treatise on the virtues of the herb Euphorbia. He died about the year 24 of the Christian era, leaving a son, Ptolemy, afterwards put to death by Caligula. Juba is quoted with great applause by Pliny, Strabo, Plutarch, Tacitus, and some other authors. His popularity, as a sovereign, was so great, that the Mauritians rewarded his benevolence by making him one of their gods. The Athenians raised him a statue, and the Ethiopians did him homage as a deity. Univer. Hist. Suet.

JUBA, in *Geography*, a town of Syria, on the right banks of the Euphrates, on a narrow slip of land, formed by the winding of the river; 90 miles W.N.W. of Bagdad. N. lat. $53^{\circ} 42'$. E. long. $41^{\circ} 58'$.

JUBAL, an island in the Red sea, N. lat. $27^{\circ} 30'$. E. long. $33^{\circ} 40'$.

JUBBIL, a town of the Arabian Irak, on the Tigris; 50 miles S.E. of Al Modain.

JUBBRA, a town of Bengal; 45 miles W.N.W. of Ramgur. N. lat. $23^{\circ} 58'$. E. long. $84^{\circ} 58'$.

JUBE, the *Ambo*, *Rood Lofi*, or gallery over the choir
4 D 2 screens

screen in our ancient churches, from which the lessons in the matins and other church offices used to be read. It was so called from the readers or cantors asking the benediction of the abbot, dean, or other superior, before he began, in the following form: "Jube Domine benedicere."

JUBILEE, among the *Jews*, denotes every fiftieth year: being that following the revolution of seven weeks of years; at which time all the slaves were made free, and all lands reverted to their ancient owners. The jubilees were not regarded after the Babylonish captivity.

The word, according to some authors, comes from the Hebrew *jobel*, which signifies *fifty*: but this must be a mistake, for the Hebrew יָבֵל, *jobel*, does not signify fifty; neither do its letters, taken as cyphers, or according to their numerical power, make that number; being 10, 6, 2, and 30, that is, 48. Others say, that *jobel* signifies a *ram*, and that the jubilee was thus called because proclaimed with a ram's horn, in memory of the ram that appeared to Abraham in the thicket. Masius chooses to derive the word from *Jubal*, the first inventor of musical instruments, which, for that reason, were called by his name; whence the word *jobel* and *jubilee* came to signify the year of deliverance and remission, because proclaimed with the sound of one of those instruments, which at first was no more than the horn of a ram. Hottinger, with whom Dr. Patrick agrees, is of opinion, that *Jobel* is a word invented to imitate the sound of the instrument; and that it does not signify the instrument itself, but the sound which it made. Others derive *jobel* from יָבַל, *jabal*, in hiphil הִבִּיל, *hobil*, which signifies to recal or return; because this year restored all slaves to their liberty, &c. The institution of this festival is in Lev. xxv. 8. 17.

The learned are divided about the year of jubilee; some maintaining that it was every forty-ninth, and others that it was every fiftieth year. The ground of the former opinion is chiefly this, that the forty-ninth year, being of course a sabbatical year, if the jubilee had been kept on the fiftieth, the land must have had two sabbaths, or have lain fallow two years, which, without a miracle, would have produced a dearth. On the other hand it is alleged, that the scripture expressly declares for the fiftieth year, Lev. xxv. 10, 11. And besides, if the jubilee and sabbatical year had been the same, there would have been no need of a prohibition to sow, reap, &c. because this kind of labour was prohibited by the law of the sabbatical year. (Lev. xxv. 4, 5.) The authors of the Universal History, book i. chap. 7. note R, endeavour to reconcile these opinions, by observing, that as the jubilee began in the first month of the civil year, which was the seventh of the ecclesiastical, it might be said to be either the forty-ninth or fiftieth, according as one or other of these computations was followed. The political design of the law of the jubilee, was to prevent the too great oppression of the poor, as well as their being liable to perpetual slavery. By this means the rich were prevented from accumulating lands for perpetuity, and a kind of equality was preserved through all the families of Israel, and the distinction of tribes was also preserved, in respect both to their families and possessions, that they might be able, when there was occasion, on the jubilee year, to prove their right to the inheritance of their ancestors. Thus also it would be known with certainty of what tribe or family the Messiah sprung. It served also, like the Olympiads of the Greeks, and the *Lustra* of the Romans, for the readier computation of time. The jubilee has also been supposed to be typical of the gospel state and dispensation, described by Isaiah, lxi. ver. 1, 2. in reference to this period, as the "acceptable year of the Lord."

Some learned men have attempted to prove by a calcula-

tion, thought by others to be tolerably exact, that if the Jews had still observed the jubilees, the fifteenth year of Tiberius, when John the Baptist first began to preach, would have been a jubilee, and consequently the last; since fifty years after, the Jewish commonwealth was no longer in being. This particular is of some consequence, if it be well founded, in our controversy with the Jews, who pretend, that the son of David will come during the last jubilee. And this also exactly agrees with the design of the gospel, already stated, which was to proclaim the grand jubilee, the spiritual freedom of the children of God foretold by the prophets Isaiah and Zechariah, and prefigured by the jubilees of the Jews. Usher places the first jubilee, after the promulgation of the law by Moses, A. M. 2609, B. C. 1395; the second A. M. 2658, B. C. 1346; the third A. M. 2707, B. C. 1297, &c. thus reckoning 49 years from jubilee to jubilee.

JUBILEE, in a *more modern sense*, denotes a grand church solemnity, or ceremony, celebrated at Rome, wherein the pope grants a plenary indulgence to all sinners; at least to as many as visit the churches of St. Peter and St. Paul at Rome.

The jubilee was first established by Boniface VIII. in 1300, in favour of those who should go *ad limina apostolorum*; and it was only to return every hundred years. But the first celebration brought in such store of wealth to Rome, that the Germans called this the golden year; which occasioned Clement VI. 1350, to reduce the period of the jubilee to fifty years. Urban VI. in 1389, appointed it to be held every thirty-five years, that being the age of our Saviour; and Paul II. and Sixtus IV. in 1475, brought it down to every twenty-five, that every person might have the benefit of it once in his life.

Boniface IX. granted the privilege of holding jubilees to several princes and monasteries: for instance to the monks of Canterbury, who had a jubilee every fifty years; when people flocked from all parts to visit the tomb of Thomas à Becket. Jubilees afterwards became more frequent, and the pope granted them as often as the church, or himself, had occasion for them. There was usually one at the inauguration of a new pope.

To be entitled to the privileges of the jubilee, the bull joins fastings, alms, and prayers. It gives the priests a full power to absolve, in all cases, even those otherwise reserved to the pope; to make commutations of vows, &c. in which it differs from a *plenary indulgence*. During the time of jubilee, all other indulgences are suspended.

See an enumeration of the various writers, who have treated of the institution of the Roman jubilee, in the "Bibliogr. Antiq." of Jo. Albert Fabricius; and the subject fully stated by the reverend Charles Chais, formerly minister of the French church at the Hague, in his "Lettres Historiques et Dogmatiques sur les Jubilés et des Indulgences," published at the Hague in three vols. 8vo. 1751. These letters contain the most full and accurate account that has ever been given of the institution of the jubilee, and of the rise, progress, abuses, and enormities of the infamous traffic of indulgences. This account is judiciously collected from the best authors of antiquity, and from several curious records that have escaped the researches of other writers: it is also interspersed with curious and sometimes ludicrous anecdotes, that render the work amusing as well as instructive. In the first volume of these letters the learned author lays open the nature and origin of the institution of the jubilee; he proves it to have been a human invention, which owed its rise to the avarice and ambition of the popes; and its credit to the ignorance and superstition of the people; the celebration of which was absolutely unknown before the thirteenth

century, which is the true date of its origin. He takes notice of the various changes which it underwent with respect to the time of its celebration, the various colours with which the ambitious pontiffs covered it, in order to render it respectable and alluring in the eyes of the multitude; and exposes these illusions by many convincing arguments, the gravity of which is seasoned with an agreeable and temperate mixture of decent raillery. He proves, with indisputable evidence, that the papal jubilee is an imitation of the "secular games" that were celebrated with such pomp in pagan Rome. He points out the gross contradictions that reign in the bulls of the different popes, with respect to the nature of this institution and the time of its celebration. Nor does he pass over in silence the infamous traffic of indulgences, the wordly pomp and splendour, the crimes, debaucheries, and disorders of every kind, that were observable at the return of each jubilee year. He lays also before the reader an historical view of all the jubilees that were celebrated from the pontificate of Boniface VIII. in the year 1300 to that of Benedict XIV. in 1750, with an entertaining account of the most remarkable adventures that happened among the pilgrims who repaired to Rome on these occasions.

One of our kings, *viz.* Edward III. caused his birth-day to be observed in manner of a jubilee, when he became fifty years of age, in 1362, but never before or after. This he did, by releasing prisoners, pardoning all offences, except treason, making good laws, and granting many privileges to the people.

We have lately, *viz.* in 1809, had a jubilee, on occasion of our sovereign George III. having attained to the fiftieth year of his reign.

There are particular jubilees in certain cities, when several of their feasts fall on the same day; at Puy en Velay, for instance, when the feast of the Annunciation happens on Good-Friday; and at Lyons, when the feast of St. John Baptist concurs with the feast of Corpus Christi.

In 1640, the Jesuits celebrated a solemn jubilee at Rome; that being the centenary, or hundredth year from their institution, and the same ceremony was observed in all their houses throughout the world.

JUBILÆUS, or JUBILEUS, is used among the Romans, to signify a religious who has been fifty years in a monastery, or an ecclesiastic who has been in orders fifty years.

Such veteran religious are dispensed with in some places from attending matins, or a strict observance of any other of their rules.

JUBILÆUS is also extended to any man a hundred years old; and to a possession or prescription for fifty years, "Si ager non invenietur in scriptione, inquiratur de senioribus, quantum temporis fuit cum altero; & si sub certo jubileo mansit sine vituperatione, maneat in æternum."

JUBO, in *Geography*, a kingdom of Africa, on the coast of Ajan, near the East Indian sea, with a capital of the same name, subject to the Portuguese. N. lat. 0° 50'. E. long. 43° 20'.—Also, a river of Africa, which runs into the Indian sea, a little to the N. of the equinoctial line, E. long. 42° 46'.—Also, a town of Africa, in the kingdom of Benin.

JUBONES, a river of Peru, which runs into the Pacific ocean, S. lat. 3° 20'.

JUCARICHI, a town of Mexico, in the province of New Biscay; 110 miles N.W. of Patral.

JUCASETZ, a town of Slavonia; 25 miles S. of Eszek.

JUCATAN. See YUCATAN.

JUCCA, in *Botany*, the name of a distinct genus of plants, otherwise called *Tucca*.

JUCENDRO, in *Geography*, a town of the island of Madagascar. S. lat. 23° 10'. E. long. 47° 14'.

JUCKASJERVI, a town of Swedish Lapland; 145 miles N.W. of Tornea. N. lat. 67° 50'. E. long. 20° 46'.

JUCKATAGHERI, a town of Hindoostan, in the Carnatic; five miles E. of Muglee.

JUCKING, the notes of a cock partridge, inviting the hen to come to him. These serve the sportsmen in good stead for finding the places where they are.

JUCLEZ, in *Geography*, a town of Turkestan; 45 miles S.W. of Turkestan.

JUCURUTA, in *Ornithology*, a very beautiful species of owl, found in the Brazils, and variegated with black and yellow.

JUD, in *Mining*, is applied, in the collieries in Derbyshire, to a certain depth of coal in the face of their work, which will fall at once, after the holers have undermined the same, and the hammer-men have applied their wedges near to the roof: it is also called the web, and the rib of coal in some places, and is limited, like the face of the coal, by parallel vertical lines or lengthway joints; the backs of New-castle colliers.

JUDÆ AURICULA. See AURICULA.

JUDÆA. See JUDEA.

JUDAH, in *Scripture Biography*, the fourth son of Jacob and Leah, was born in Mesopotamia, A.M. 2249, B.C. 1755; and was always regarded as the chief of Jacob's children. The privileges of the first-born seem to have been transferred from Reuben to him, after the incest of Reuben with Bilhah his father's wife. For the blessing pronounced by Jacob on his death-bed to Judah, see Gen. xlix. 8—12. That part of it which occurs in the 10th verse, seems to imply, that the regal power should not go out of his family, and that the Messiah should derive his birth from it.

JUDAH, LEO, in *Biography*, a learned Protestant divine, son of John Judah, a German priest, was born in the year 1482. When he was about twenty years of age, he was sent to Basil to pursue his academical studies. Here he had for a fellow student, the afterwards much celebrated Zuingli, and from him, who had at a very early age been shocked at the superstitious practices of the church of Rome, he received such impressions, and was directed to such enquiries, as predisposed him to embrace the reformed religion. Having obtained his degree of M.A. he was appointed minister of a Swiss church, to the duties of which he applied himself with indefatigable zeal. His studies led him to renounce the distinguishing tenets of popery, and an adoption of those of the reformation. He openly preached in defence of the Protestant religion, was appointed by the magistrates and ecclesiastical assembly of Zurich, pastor of the church of St. Peter in that city, and became very celebrated as an advocate, as well from the press as the pulpit, of the system to which he was a convert. At the desire of his brethren, he undertook a translation, from the Hebrew into Latin, of the whole Old Testament. The magnitude of the work, and the closeness with which he applied to it, were more than he was able to bear, and before he had completed it, he fell a sacrifice to his labours in 1542, when he was about sixty years of age. The translation was finished by other hands, and was printed at Zurich in 1543, and two years afterwards it was reprinted at Paris by Robert Stevens, accompanying the vulgate version, in adjoining columns, but without the name of the author of the new version. Judah was likewise the author of "Annotations."

tions" on divers books of the Old and New Testament, and of two catechisms. Gen. Biog.

JUDAH, *Tribe of*, in *Scripture Geography*, a canton of Palestine, which extended S. of Benjamin, about 27 miles, quite to the mountains of Seir, or Edom, which were the frontiers between it and Idumæa. It was bounded on the E. by the Dead sea, and on the W. by the tribes of Dan and Simeon, both which lay between it and the Mediterranean. Judah was reckoned the largest and most populous tribe of all the twelve, and the inhabitants were the stoutest and most valiant. It was, moreover, the chief and royal tribe, from which the kingdom was denominated. The land was beautifully variegated with fertile plains, hills, dales, lakes, and fountains, and it produced great plenty of corn, wine, oil, fruits, and pasture, except where it lay contiguous to Idumæa. It was properly in this territory of Judah, that the Canaanites dwelt, and here Abraham and his descendants sojourned, till they went down into Egypt. The most remarkable places of this tribe were Azekah, Bethlehem, Bethzor, Emmaus, Engedi, Hebron, Libna, Makkedah, Maon, Massada, Tekoah, and Ziph; which see respectively.

One of the principal prerogatives of this tribe was, that it preserved the true religion, and the public exercise of the priesthood, with the legal ceremonies in the temple of Jerusalem; while the ten tribes gave themselves up to idolatry, and the worship of the golden calves. This tribe, at the Exodus, was composed of 74,600 men, capable of bearing arms.

JUDAH, *Kingdom of*, a denomination given to the maimed kingdom of Rehoboam, in contradistinction to that of Israel, upon the revolt of the ten tribes. The crown passed from Benjamin (from Saul and Ishbosheth) into Judah, which was David's tribe, and that of the kings his successors, until the Babylonish captivity. And after the return from that captivity, although this tribe did not reign, it gave the sceptre to those who did reign, and in a certain sense reunited in itself the whole Hebrew nation, which from that time was known only as "Judæi," Jews, descendants of Judah. See **JEWS** and **ISRAEL**.

JUDAICUS LAPIS, a small, grey, soft, brittle stone, in form of an olive, having lines drawn regularly on its surface, as if they were formed by art.

This is a kind of extraneous fossil, being a spine of an echinus marinus petrified. This stone has by many been supposed to be a fossil body in its native figure, but is really the remains of a spine of an echinus, filled with a plated spar. It is very common in Syria, and is sometimes found with us. See **SPAR**.

These extraneous fossils are the petrified spines of echini, aculei echinorum, or teclithi of Pliny, which the chalk strata, and those of the Bath freestone in England, produce in great perfection and variety of shapes; some of them occasioned by disease in the animal, as is probable, from the observations of Mr. Sowerby. It is not very common, that the spines are found attached to the fossil echini: a specimen of this kind, imbedded in a black flint, sold for 20 guineas, we are told, at the sale by auction of the late sir Alton Lever's museum. The fossil spines of most of the echini differ so much from the recent spines, that Linnaeus doubted whether they really were such, a matter now placed beyond any doubt, by the discovery of specimens like that above mentioned.

JUDAISM, the religious doctrines and rites of the Jews, which, as well as their commonwealth, (see **THEOCRACY**), are attributed by Moses wholly to God. Judaism was but a temporary dispensation, and was to give way, at

least the ceremonial part of it, at the coming of the Messiah. For a complete system of Judaism, see the books of Moses. Judaism was anciently divided into several sects; the principal whereof were the *Pharisees*, *Sadducees*, and *Essenes*; which see respectively.

At present there are two sects among the Jews, viz. the *Caraites*, (which see,) who admit of no rule of religion but the law written by Moses; and the *Rabbinists*, who add to the law the traditions of the Talmud. See **RABBINISTS** and **TALMUD**.

It has been observed that Judaism, of all religions, is that which is the most rarely abjured. In the 18th of Edward I. the parliament granted the king a fifteenth for the expulsion of Judaism.

In England formerly, the Jews and all their goods belonged to the chief lord where they lived, and he had such absolute property in them, that he might sell them; for they had not liberty to remove to another lord without leave. Mat. Paris tells us, that Henry III. sold the Jews to earl Richard, his brother, for a term of years, that *quæ rex excoiaverat, comes evinceret*.

They were distinguished from the Christians both living and dying; for they had proper judges and courts wherein their causes were tried, and they wore a badge on their breast over their clothes in shape of a table; and they were fined, if they stirred abroad without such badges. They were never buried in the country, but always brought up to London, and interred without the walls.

JUDAN, in *Geography*, a town of Hindoostan, in Baglana; 20 miles W. of Junere.

JUDAS MACCABÆUS. See **MACCABÆUS**.

JUDAS-tree, in *Botany*. See **CERCIS**.

JUDDA, in *Geography*, a town of Hindoostan, in the circar of Gurrah; 10 miles E. of Mahur.

JUDE, or *the Epistle of Jude*, a canonical book of the New Testament, written against the heretics, who, by their impious doctrines and disorderly lives, corrupted the faith and good morals of the Christians.

The author of this epistle, called Judas, and also Thaddeus and Lebbeus, was one of the 12 apostles; he was the son of Alpheus, brother of James the Less, and one of those who were called our Lord's brethren. We are not informed, when or how he was called to be an apostle; but it has been conjectured, that before his vocation to the apostleship he was an husbandman, that he was married, and that he had children. The only account we have of him in particular, is that which occurs in John, xiv. 21, 22, 23. It is not unreasonable to suppose, that, after having received, in common with the other apostles, extraordinary gifts at the pentecost, he preached the gospel for some time in several parts of the land of Israel, and wrought miracles in the name of Christ. And, as his life seems to have been prolonged, it is probable that he afterwards left Judea, and went abroad preaching the gospel to Jews and Gentiles in other countries. Some have said that he preached in Arabia, Syria, Mesopotamia, and Persia; and that he suffered martyrdom in the last-mentioned country. But we have no account of his travels upon which we can rely; and it may be questioned whether he was a martyr.

In the early ages of Christianity, several rejected the Epistle of St. Jude, because the apocryphal books of Enoch, and the ascension of Moses, are quoted in it. Nevertheless it is to be found in all the ancient catalogues of the sacred writings; and Clement of Alexandria, Tertullian, and Origen, quote it as written by Jude, and reckon it among the books of sacred scripture: in the time of Eusebius it was generally received. **AS** to the objections that have

been

been urged against its authority, Dr. Lardner suggests, that there is no necessity for supposing that St. Jude quoted a book called Enoch, or Enoch's prophecies; and even allowing that he did quote it, he gives it no authority; it was no canonical book of the Jews, and if such a book existed among the Jews, it was apocryphal, and yet there might be in it some right things. Instead of referring to a book, called the "Assumption or Ascension of Christ," which probably was a forgery much later than his time, it is much more credible, that St. Jude refers to the vision in Zech. iii. 1-3. It has been the opinion of several writers, and among others of Hammond and Benson, that St. Jude addressed his epistle to Jewish Christians; but Dr. Lardner infers, from the words of the inscription of the epistle v. 1, and v. 3, that it was designed for the use of all in general, who had embraced the Christian religion. The last mentioned author supposes, that this epistle was written in the year of Christ 64, 65, or 66. Lardner's Works, vol. vi. See EPISTLE.

JUDEA, in *Ancient Geography*, a province of Asia, more anciently called the *land of Canaan*, the *land of Promise*, the *Holy Land*, and *Palestine*; which see. It was called *Judea*, from Judah, whose tribe was the most considerable of the 12, and possessed the most fertile part of the whole. It did not assume the name of Judea, till after the return of the Jews from the Babylonish captivity, though it had been denominated, long before, the kingdom of Judah, in opposition to that of Israel. After their return, this tribe, which was the only one that made a figure, settled first at Jerusalem, and in the adjacent territories, and then spread through the whole country, so that the name of Jehudah and Jehudim extended itself to all the rest. (See JUDAH.) Judea was also called Syria, Palæstina-Syria, Cœle-Syria, and Phœnicia. It was also called Idumæa, merely because the Idumæans seized on some parts of it during the Babylonish captivity. The modern name, especially among Christians and Mahometans, is *Palestine*; which see.

Before the arrival of the Hebrews, Judea was governed by Canaanitish kings, each in his respective city. (See CANAAN.) When Joshua conquered it, he governed it as the vicegerent of Jehovah, according to the form of the Jewish theocracy. The elders succeeded Joshua, about 15 years; after which the Israelites fell into a kind of anarchy for seven or eight years. They were governed by Judges for about 317 years; then by kings from Saul to the Babylonish captivity about 507 years. After the captivity, Judah continued subject to the kings of Persia, then to Alexander the Great, and his successors; sometimes to the kings of Syria, sometimes to the kings of Egypt; paying, nevertheless, great deference, in matters of private government, to the high priest, and to princes of the family of David. From the time of the Maccabees, they continued in possession of the sovereign authority, till the reign of Herod the Great, about 135 years. See JEWS.

JUDENBACH, in *Geography*, a town of Germany, in the principality of Coburg; 12 miles N.E. of Coburg.

JUDENBURG, a town and capital of Upper Stiria, on the river Muehr, on a plain surrounded with lofty mountains, always covered with snow. It has a castle, college, and two convents. The French took it in 1797; 32 miles W.N.W. of Gratz. N. lat. 47° 10'. E. long. 14° 25'.

JUDGE, an officer appointed by the sovereign powers of any country, to distribute that justice to their subjects which they cannot administer in person.

The character of judge is part of the regal authority, whereof the king divests himself.

The chief function of judges is for the trial of causes both civil and criminal.

The English judges are chosen out of the serjeants at law, and are constituted by letters patent. Their commissions are bounded with this limitation, "facturi quod ad justitiam pertinent secundum legem & consuetudinem Angliæ;" and at their creation they take an oath, that they will indifferently minister justice to all them that shall have any suit or plea before them; and this they will not forbear to do, though the king by his letters, or by express word of mouth, should command the contrary; and they are answerable in body, land, and goods. 18 Ed. III. c. 1.

By the law of England all judges must derive their authority from the crown, by some commission warranted by law. The judges of the king's bench, common pleas, and the barons of the exchequer, are all (excepting the chief justice of the king's bench, who is created by writ) appointed by patent. Formerly they held their places only during the king's pleasure; but now, for the greater security of the liberty of the subject, by statute 13 Will. III. c. 2. their commissions are to be *quamdiu se bene gesserint*, and their salaries are ascertained and established; and by 1 Geo. III. cap. 23. they are to continue, notwithstanding the demise of the crown; and their full salaries are absolutely secured to them during the continuance of their commissions. Though upon an address of both houses of parliament they may be lawfully removed.

Judges must exercise their authority in a legal manner, and hold their courts in their proper persons; for they cannot act by deputy, nor any way transfer their power to another, as the judges of ecclesiastical courts may. Yet when there are several judges in a court of record, the act of any one of them is effectual, provided their commissions do not require more: so likewise what is executed by a majority present, is the act of the court; but where they are equally divided in opinion, the cause is to be removed into the exchequer chamber, and for that purpose a rule is to be made, and the record certified, &c. Some things done by judges at their chambers are accounted as done by the court; and that they may be prepared to hear what is to come before them, they are to have a paper of the causes to be heard, sent to them by the attornies the day before they are spoken to; that if, upon reading the record of any cause, any special matter that arises should appear doubtful, they may satisfy themselves by consulting books.

The judges are bound by oath to determine according to the known laws and ancient customs of the realm. Their rule herein must be the judicial decisions and resolutions upon the various causes that have occurred, and not their own arbitrary will and pleasure, or that of their prince.

Judges are free from all prosecutions for any thing done by them in court, which appears to have been an error of their judgment. But for wilful corruption, they have been complained of to the star-chamber formerly, and may now be called to an account in parliament.

It has been said, that scandalous reflections on the judges in Westminster-hall are within the statute of *scandalum magnatum*.

Those who use threatening or reproachful words to a judge sitting in the courts, are guilty of a high misprison, and have been punished with large fines, imprisonment, and corporal punishment. (Cro. Car. 503.) Assaulting a judge, sitting in the court, by drawing a weapon, without any blow struck, is punishable with the loss of the right hand, imprisonment for life, and forfeiture of goods and chattels, and of the profits of the person's lands during life (3 Inst.

140, 141.); and slaying the chancellor, treasurer, or the king's justices of either bench, justices in eyre, or justices of assize, and all other justices assigned to hear and determine, being in their places doing their offices, is a species of treason by 25 Edw. III. c. 2. However, the barons of the exchequer, as such, are not within the protection of this act. (1 Hal. P. C. 231.) Judges, who become solicitors in a cause which they are to judge, and privately and extrajudicially tamper with witnesses, or labour jurors, may be dealt with according to the same capacity to which they basely degrade themselves. Bribery in judges is punishable by loss of office, fine, and imprisonment; and by the common law, bribery of judges in relation to a cause depending before them, has been punished as treason. If a judge ignorantly condemns a man to death for felony, when it is not felony; for this offence he shall be fined and imprisoned, and lose his office. If a judge, who hath no jurisdiction of the cause, give judgment of death and award execution, which is executed, such judge is guilty of felony; and also the officer who executes the sentence. And if justices of the peace, on indictments of trespass, arraign a man of felony, and judge him to death, and he is executed, it is felony in them. A judge ought not to judge in his own cause, nor in pleas where he is party.

It was formerly enacted, stat. 33 Hen. VIII. c. 24. that none should be justices of assizes within the county where they were born, or do inhabit: but this is repealed by a late statute, 12 Geo. II. c. 27.

It was formerly held, that by a justice's acceptance of any new name of dignity, his commission was determined; but this was remedied by statute 1 Edw. VI. c. 7. But it has been doubted, whether the dignity of baronet, created since that statute, is within the equity of it.

JUDGES of Hell. See HELL and TARTARUS.

JUDGE, Itinerant. See ITINERANT.

JUDGE Martial, or Advocate General, the supreme judge in martial law as to the jurisdiction and powers of military courts. It is incumbent upon this person, as well as upon his deputies, to be well acquainted with the laws of the land, that they may admonish the court or president when their proceedings are tending to infringe the civil law. He is register of courts-martial, and should take down the evidence in the very words of the witness. He is neither a judge nor a juror as to the charge.

JUDGE, in Scripture, is applied to certain eminent persons chosen by God himself to govern the Jews, from the time of Joshua till the establishment of the kings. For the nature and duration of their office, and the powers with which they were invested, see JEWS.

The judges were not ordinary magistrates, but were appointed by God on extraordinary occasions, as to head the armies, to deliver the people from their enemies, &c.—Salian has observed that they not only presided in courts of justice, but were also at the head of the councils, the armies, and of every thing that concerned the government of the state; though they never assumed the title either of princes, governors, or the like.

Salian remarks seven points wherein they differed from kings. 1. They were not hereditary. 2. They had no absolute power of life and death, but only according to the laws, and dependently upon them. 3. They never undertook war at their own pleasure, but only when they were commanded by God, or called to it by the people. 4. They exacted no tribute. 5. They did not succeed each other immediately, but after the death of one there was frequently an interval of several years before a successor was appointed.

6. They did not use the ensigns of sovereignty, the sceptre or diadem. 7. They had no authority to make any laws, but were only to take care of the observance of the laws of Moses.

Godwin, in his "Moses and Aaron," compares them to the Roman dictators, who were appointed only on extraordinary emergencies, as in case of war abroad, or conspiracies at home; and whose power, while they continued in office, was great, and even absolute. Thus the Hebrew judges seem to have been appointed only in cases of national trouble and danger. This was the case particularly with respect to Othniel, Ehud, and Gideon. The power of the judges, while in office, was very great; nor does it seem to have been limited to a certain time, like that of the Roman dictators, which continued for half a year: nevertheless it is reasonable to suppose, that when they had performed the business for which they were appointed, they retired to a private life. This Godwin infers from Gideon's refusing to take upon him the perpetual government of Israel, as being inconsistent with the theocracy.

Besides these superior judges, every city in the Hebrew commonwealth had its elders, who formed a court of judicature, with a power of determining lesser matters in their respective districts. The rabbies say, there were three such elders or judges in each lesser city, and twenty-three in greater. But Josephus, whose authority has greater weight, speaks of seven judges in each, without any such distinction of greater and less. Sigonius (De Republ. Heb. l. vi. c. 6.) supposes that these elders and judges of cities were the original constitution settled in the wilderness by Moses, upon the advice given him by Jethro (Exod. xxviii. 21, 22.); and continued by divine appointment after the settlement in the land of Canaan: whereas, others imagine that the Jethronian prefectures were a peculiar constitution, suited to their condition while encamped in the wilderness, but laid aside after they came into Canaan. It is certain, however, that there was a court of judges and officers, appointed in every city, by the law of Moses. (Deut. xvi. 18.) How far, and in what respects, these judges differed from the elders of the city, it is not easy to ascertain; and whether they were the same or different persons. Perhaps the title elders may denote their seniority and dignity; and that of judges, the office they sustained. The lower courts of justice, in their several cities, were held in their gates. (Deut. xvi. 16.) See GATE. Each tribe had its respective prince, whose office related chiefly, if not altogether, to military affairs. We read also of the princes of the congregation, who presided in judiciary matters. These are called elders, and were seventy in number. (Numb. xi. 16, 17, 24, 25.) But it does not appear whether or not this consistory of seventy elders was a perpetual, or only a temporary institution. Some have supposed that it was the same that afterwards became famous under the appellation of Sanhedrim; but others conceive the institution of the seventy elders to have been only temporary, for the assistance of Moses in the government, before the settlement in the land of Canaan; and that the Sanhedrim was first set up in the time of the Maccabees. See SANHEDRIM.

JUDGE, in Mining, is applied, in the coal-pits of Nottinghamshire and Derbyshire, to a piece of board cut to a wedge-like shape, which should fit exactly into any part of the excavation made under the face or bank of the coals, by the holers, in order to loosen them. The length of the judge is regulated by the depth or width of the jud, or web of coal which will fall at once: and the overlooker is required daily to try the judge in the holing, to see that the holers

holers undermine sufficiently far back ; and yet, in order to save themselves trouble, do not make the hole higher than the judge, and thereby cut away and waste the jud of coal. These processes of coal-digging are particularly described in Mr. Farey's Report, vol. i. p. 344.

JUDGES, or *Book of Judges*, is a canonical book of the Old Testament, containing the history of the Israelite judges, of whom we have been speaking in a preceding article.

The author is not known : it is probable the work did not come from any single hand, being rather a collection of several little histories, which at first were separate, but were afterwards collected by Ezra, or Samuel, into a single volume ; and, in all likelihood, were taken from the ancient journals, annals, or memoirs, composed by the several judges.

The antiquity of this book is unquestionable, as it must have been written before the time of David ; since the description (chap. i. v. 21.) was no longer true of Jerusalem, after he had taken possession of it, and had introduced a third class of inhabitants of the tribe of Judah. Eichorn acknowledges, that it doth not bear any marks of subsequent interpolation. Dr. Patrick is of opinion that the five last chapters are a distinct history, in which the author gives an account of several memorable transactions, which occurred in or about the time of the judges ; whose history he would not interrupt by intermixing these matters with it, and therefore reserved them to be related by themselves, in the second part, or appendix. In these he first gives an account how idolatry crept into the tribe of Ephraim, then how it was propagated among the Danites ; after which he relates a most heinous act of adultery, committed in the tribe of Benjamin ; which introduces the history, first, of the almost total destruction of that tribe for their countenancing that detestable fact, and then of its restoration. Eichorn also supposes that these chapters are distinct fragments of a less certain date, but posterior to David (chap. xviii. v. 31.), under whom the house of God ceased to be in Shiloh.

JUDGMENT, or the second operation of the mind in the acquisition of knowledge (the first being perception), is a faculty of the soul, by which it perceives the relation between two, or more, ideas : or the concurrence or coincidence of two ideas, or the want of concurrence or coincidence. Two ideas, being compared together, concur, as in the instance of milk and whiteness ; and they coincide, as in those of God and Creator ; or they do not concur, as vice and usefulness, or they do not coincide, as man and brute.

Thus, when we judge, that the sun is greater than the moon, the understanding first compares the two ideas of the sun and the moon ; and, finding the idea of the sun greater than that of the moon, the will perfectly acquiesces in that perception, nor puts the mind upon any farther enquiry.

It is not the understanding, then, that judges, as is ordinarily thought ; judgments and reasonings on the part of the understanding, are but mere perceptions ; it is the will alone that judges, by acquiescing in what is represented to it by the understanding.

The only difference, then, between *perception*, *judgment*, and *reasoning*, so far as the understanding is concerned in them, is this ; that it perceives a thing simply, without any relation to any other thing, in a simple perception ; that it perceives the relations between two or more things in judgments ; and, lastly, that it perceives the relations that are between the relations of things in reasonings ; so that all the

operations of the understanding are in effect no more than pure perceptions.

Thus, when we perceive, for instance, twice 2, or 4, this is no more than a simple perception ; when we judge, that twice 2 are 4, or that twice 2 are not 5, the understanding does no more than barely perceive the relation of equality that is between twice 2 and 4, or of inequality between twice 2 and 5. Farther, reasoning consists in perceiving the relation, not between two or more things, for that would be a judgment, but of two or more relations of two or more things : thus, when I conclude, that 4 being less than 6, twice 2 being 4, are by consequence less than six ; I perceive not only the relation of inequality between 2 and 4, and 6 (for this were only a judgment), but also the relation of inequality between the relation of twice 2 and 4, and the relation between 4 and 6 ; which constitutes a reasoning. The understanding, therefore, only perceives, and it is the will that judges and reasons, in assenting voluntarily to what the understanding represents.

Indeed, when the things which we consider appear clear and perfectly evident, it seems as if it were not voluntarily, that the mind consents to them ; whence we are led to think, that it is not properly the will, but the understanding that judges of them. But to clear this point it must be observed, that the things which we consider, never appear entirely evident, till the understanding has examined them on all sides, and has perceived all the relations necessary to judge of them ; whence it happens, that the will, not being able to will any thing without knowledge, cannot act on the understanding ; that is, cannot desire it to represent any thing new in its object, as having already viewed it on all sides that have any relation to the question in hand. It is obliged then to rest in what has been already represented, and to cease to agitate and disturb it any farther ; in which cessation it is that judgment consists.

This rest or judgment, then, not being free when things are in their last evidence, we are apt to imagine, that it is not the effect of the will. So long as there is any thing obscure in the subject that we consider, or that we are not fully satisfied that we have discovered every thing necessary to resolve the question, as it happens in most of those things that are difficult, and that contain various relations ; we remain at liberty not to acquiesce : the will may command the understanding to pursue its enquiries farther, and to make new discoveries, whence it is, that we are more ready to allow the judgments formed on these subjects to be voluntary.

Most philosophers, however, maintain, that even the judgments which we form on obscure things are not voluntary ; and will have our consenting to the truth to be an action of the understanding, which they call *assent*, to distinguish it from our consenting to goodness, which they attribute to the will, and call it *consent*.

But their error is owing to this, that in our present state we frequently see things to be evidently true, without the least reason to doubt of them ; in which case the will is not at liberty either to give or refuse her assent : but it is not so in matters of goodness ; there being nothing, which we do not know some reason for forbearing to love. So that we here perceive a manifest indifference, and are fully convinced, that when we love any thing, even God, for instance, we use our liberty, and do it voluntarily. But the use we make of our liberty is not so apparent, when we consent to the truth, especially when it appears perfectly evident : and this leads us to think, that our consent to truth, that is, our judgment, is not voluntary ; as if an action, to be voluntary, must be indifferent ; as if the blessed above did not love God, voluntarily,

rarily, because they cannot be diverted from it by any other thing; nor we consent freely to this evident proposition, that twice 2 are 4, because we have no appearance of reason to dissuade us from it.

Mr. Locke (b. iv. c. 14) distinguishes between knowledge and judgment; the former being that faculty of the mind, by which it certainly perceives, and is undoubtedly satisfied of the agreement or disagreement of any ideas; the latter, or judgment, is the putting of ideas together, or the separating of them from one another in the mind, when their certain agreement or disagreement is not perceived, but presumed to be so; which is, as the word imports, taken to be so before it certainly appears; and if it so unites or separates them, as in reality things are, it is right judgment. A judgment, called by Mr. Locke a mental proposition, is that union or separation of the ideas which is the result of the act of judging; and this may exist without any connection with words; though, as men are very much used to connect ideas with words, it is very difficult to treat of judgments as distinguished from verbal propositions. (See PROPOSITION.) The sources of judgment are consciousness, sense, intuition, and testimony. See each of these articles respectively. The definition commonly given of judgment, by the more ancient writers in logic, was, that it is an act of the mind, by which one thing is affirmed or denied of another. Dr. Reid thinks this to be as good a definition as can be given, and prefers it to some others; but it is evidently liable to objections, which he has stated. Judgment is a solitary act of the mind, and the expression of it by affirmation or denial is not at all essential to it; and therefore the definition must be restricted to mental affirmation or denial, which, as he says, is only another name for judgment. Besides, affirmation or denial is very often the expression of testimony, which is a different act of the mind, and ought to be distinguished from judgment. Judgment, as Dr. Reid proceeds to observe, is an act of the mind specifically different from simple apprehension, or the bare conception of a thing; for although there can be no judgment without a conception of the things about which we judge, yet conception may be without any judgment. Judgment can be expressed by a proposition only, and a proposition is a complete sentence; but simple apprehension may be expressed by a word or words, which make no complete sentence. It is self-evident, that every judgment must be either true or false; but simple apprehension or conception can neither be true nor false. Again, one judgment may be contradictory to another; and it is impossible for a man to have two judgments at the same time, which he perceives to be contradictory. But contradictory propositions may be conceived at the same time without any difficulty. Dr. Reid observes, that there are some notions or ideas that ought to be referred to the faculty of judgment as their source; because if we had not that faculty, they would not enter into our minds; e. g. we could not have the idea of any relation without some exercise of judgment, and yet the relations of things constitute one great class of our notions or ideas. It is further remarked, that in persons come to years of understanding, judgment necessarily accompanies all sensations, perception by the senses, consciousness and memory, but not conception. The man who feels pain, judges and believes that he is really pained; a person who perceives an object believes that it exists, and is what he distinctly perceives it to be; nor is it in his power to avoid such judgment; and the same may be said of memory and consciousness. All operations of this kind are accompanied with a determination that something is true or false, and a consequent belief. If this determination be not judgment, it is an operation without a name; for it is

not simple apprehension, neither is it reasoning; it is a mental affirmation or negation; it may be expressed by a proposition affirmative or negative, and it is accompanied with the firmest belief. "These," says Dr. Reid, "are the characteristics of judgment, and I must call it judgment, till I can find another name for it." The judgments we form are either of things necessary, or of things contingent. Our assent to necessary propositions is not grounded upon any operation of sense, of memory, or consciousness, nor does it require their concurrence; it is unaccompanied by any other operation but that of conception, which must accompany all judgment; and therefore this judgment of things necessary may be called pure judgment. Our judgment of things contingent must always rest upon some other operation of the mind, such as sense or memory, or consciousness, or credit in testimony.

In common language, there are many forms of speech which shew that the senses, memory, and consciousness, are considered as judging faculties. Evidence is the ground of judgment, and when evidence is perceived, it is impossible not to judge. Dr. Reid, adverting to the notion of judgment, which, he thinks, is peculiar to Mr. Locke, and which we have already stated, expresses his opinion, that there can be no knowledge without judgment, though there may be judgment without that certainty which we commonly call knowledge. In order to avoid disputes about the meaning of words, this author wishes to be understood as giving the name of judgment to every determination of the mind concerning what is true or what is false. This, he thinks, is what logicians, from the days of Aristotle, have called judgment. "Whether it be called one faculty," he says, "as I think it always has been, or whether a philosopher chuses to split it into two, seems not very material. And if it be granted, that by our senses, our memory and consciousness, we not only have ideas or simple apprehensions, but form determinations concerning what is true and what is false; whether these determinations ought to be called *knowledge* or *judgment*, is of small moment."—"Philosophers," says the same writer, "have never been able to give any definition of judgment which does not apply to the determination of our senses, our memory, and consciousness, nor any definition of simple apprehension which can comprehend those determinations." Judgments of this kind may, in the strictest sense, be called "judgments of nature," nor do they admit of improvement by culture.

Dr. Reid further observes, that some exercise of judgment is necessary in the formation of all abstract and general conceptions, whether they be more simple or more complex; in dividing, in defining, and, in general, in forming all clear and distinct conceptions of things, which are the only fit materials of reasoning. He adds, that all our notions of relations may more properly be ascribed to judgment as their source and origin, than to any other power of the mind. The notions of unity and number are so abstract, that it is impossible they should enter into the mind until it has some degree of judgment. Judgment is also an ingredient in all matters of taste; in all moral determinations; and in many of our passions and affections. So that this operation, after we come to have any exercise of judgment, mixes with most of the operations of our minds, and, in analysing them, cannot be overlooked without confusion and error. Reid's Essays, *ess. vi. chap. 1.*

JUDGMENT, in a *Legal Sense*, is a sentence or decision pronounced by authority of a king, or other power, either by their own mouth, or by that of their judges, and officers, whom they appoint to administer justice in their stead.

Judgments are the sentence of the law, pronounced by the

the court upon the matter contained in the record; and they are of four sorts. 1st. Where the facts are confessed by the parties, and the law determined by the court; as in case of judgment upon *demurrer*. (See DEMURRER.) 2dly. Where the law is admitted by the parties, and the facts disputed; as in case of judgment upon a *verdict*. (See VERDICT.) 3dly. Where both the fact and the law arising thereon are admitted by the defendant; which is the case of judgments by *confession* or *default*. (See those articles.) 4thly. Where the plaintiff is convinced that either fact, or law, or both, are insufficient to support his action, and therefore abandons or withdraws his prosecution; which is the case in judgments upon a *non suit* or *retraxit*; which see.

The judgment, though pronounced or awarded by the judges, is not their determination or sentence, but the determination and sentence of *the law*; and, in short, it is the remedy prescribed by law for the redress of injuries; and the suit or action is the vehicle or means of administering it. What that remedy may be, is, indeed, the result of deliberation and study to point out; and therefore the title of the judgment is, not that it is decreed or resolved by the court, for then the judgment might appear to be their own; but "it is considered," *consideratum est per curiam*, that the plaintiff do recover his damages, his debt, his possession, and the like; which implies, that the judgment is none of their own; but the act of law, pronounced and declared by the court, after due deliberation and enquiry. All these species of judgments are either *interlocutory* or *final*. For the former, see INTERLOCUTORY. *Final* judgments are such as at once put an end to the action, by declaring that the plaintiff has either entitled himself, or has not, to recover the remedy for which he sues. In which case, if the judgment be for the plaintiff, it is also considered, that the defendant be either amerced, for his wilful delay of justice in not immediately obeying the king's writ by rendering the plaintiff his due (8 Rep. 40. 61.); or be taken up, *capitur*, till he pays a fine to the king for the public misdemeanor, which is coupled with the private injury, in all cases of force (8 Rep. 59. 11 Rep. 43. 5 Mod. 285.), of falsehood in denying his own deed, (F. N. B. 124. Co. Litt. 131. 8 Rep. 60. 1 Roll. Abr. 219. Lill. Entr. 379. C. B. Hil. 4 Ann. Rot. 430.) or unjustly claiming property in replevin, or of contempt by disobeying the command of the king's writ or the express prohibition of any statute. (8 Rep. 60.) But now, in case of trespass, ejectment, assault, and false imprisonment, it is provided by the statute 5 & 6 W. & M. c. 12., that no writ of *capias* shall issue for this fine, nor any fine be paid; but the plaintiff shall pay 6s. 8d. to the proper officer, and be allowed it against the defendant among his other costs. And therefore upon such judgments, in the common pleas, they used to enter that the fine was remitted, and now in both courts they take no notice of any fine or *capias* at all. (Salk. 54. Carth. 390.) But if judgment be for the defendant, then in case of fraud and deceit to the court, or malicious or vexatious suits, the plaintiff may also be fined (8 Rep. 59, 60.); but in most cases it is only considered, that he and his pledges of prosecuting be (nominally) amerced for his false claim, *pro falso clamore suo*, and that the defendant may go thereof without a day, *eat inde sine di*, that is, without any further continuance or adjournment; the king's writ, commanding his attendance, being now fully satisfied, and his innocence publicly cleared. To judgments costs are a necessary appendage. See COSTS. Blackst. Com. book iii.

In every judgment there ought to be three persons, *actor*, *reas*, and *judex*; plaintiff or prosecutor, defendant, and judge.

Judgment may be given not only upon the trial of the issue, but on a default, confession, demurrer, or an outlawry, which is a judgment in itself. After issue joined in a cause, the plaintiff may, if he thinks proper, accept of a judgment from the defendant; but on such a judgment, a writ of error may be had without putting in bail, which cannot be done on a judgment after verdict. All judgments given in courts of record must be entered; in order to which the plaintiff's attorney, four days after the record is brought into court, may, if the judgment is out, enter judgment by the usual course of the court; but he cannot do this sooner, because the defendant must have time to bring in a writ of error, or to find out matter for an arrest of judgment. The defendant may oblige the plaintiff to enter his judgment, in order that he may plead it to any other action; and judgment upon a demurrer to a declaration, &c. which does not pass upon the merits of the cause, is no bar to it, though other judgments may be pleaded in bar to any action brought again for the same thing. Judgments are to continue till they are reversed; but an action of debt will lie on a good judgment, as well after a writ of error is brought, as before it. If a plaintiff does not take out an execution within a year and a day after judgment is obtained, the judgment must be revived by a *scire facias*.

JUDGMENT for Crimes, succeeds trial and conviction, in such crimes and misdemeanors as are either too high, or too low, to be included within the benefit of clergy. For when, upon a capital charge, the jury have brought in their verdict guilty, in the presence of the prisoner; he is either immediately, or at a convenient time soon after, asked by the court, if he has any thing to offer, why judgment should not be awarded against him. And in case the defendant be found guilty of a misdemeanor, (the trial of which may, and does usually, happen in his absence, after he has once appeared,) a *capias* is awarded and issued, to bring him in to receive his judgment; and, if he absconds, he may be prosecuted even to outlawry. (See ARREST of Judgment.) When all resources fail, the court must pronounce that judgment, which the law hath annexed to the crime. Judgment, in case of treason or felony, must be by an express sentence, an outlawry, or abjuration; and no judgment can be inflicted contrary to law, or that is not appointed by act of parliament. These judgments are of very different kinds, some are capital, extending to the life of the offender, and consisting generally in being hanged by the neck till dead; though in very atrocious crimes or other circumstances of terror, pain, or disgrace, are superadded; as in treasons of all kinds, the offender is sentenced to be drawn or dragged to the place of execution; in high treason affecting the king's person or government, emboweling alive, beheading, and quartering; and in murder, a public dissection. In case of any treason committed by a female, the judgment is to be burned alive. But the humanity of the English nation has authorized, by a tacit consent, an almost general mitigation of such part of these judgments as favour of torture or cruelty; a sledge or hurdle being usually allowed to such traitors as are condemned to be drawn; and there being few instances (and those accidental or by negligence) of any person's being embowelled or burned, till previously deprived of sensation by strangling. (See EXECUTION of Criminals.) Some punishments consist in exile or banishment, by abjuration of the realm, or transportation; others in loss of liberty, by perpetual or temporary imprisonment. Some extend to confiscation, by forfeiture of lands, or moveables, or both, or of the profits of land for life; others induce a disability of holding offices or employments, being heirs, executors, and the like. Some, though rarely, occasion a mutilation, or dismembering, by

cutting off the hand, or ears; others fix a lasting stigma on the offender, by sitting the nostrils; or branding in the hand or cheek. Some are merely pecuniary, by stated, or discretionary fines; and lastly there are others, that consist principally in their ignominy, though most of them are mixed with some degree of corporal pain; and these are inflicted chiefly for such crimes, as either arise from indigence, or render even opulence disgraceful. Such are whipping, hard labour in the house of correction or otherwise, the pillory, the stocks, and the ducking stool. Blackst. Com. book iv.

JUDGMENTS *for Debts* are acknowledged by a person's giving a general warrant of attorney to any attorney of the court in which it is to be acknowledged, to appear for him at the suit of the party to whom the same is to be done, and to file common bail, receive a declaration, and then to plead, *non sum informatus*, I am not informed; or to let it pass by *nihil dicit*, he says nothing; upon which judgment is entered for want of a plea. Judges that sign judgment of lands, are to set down the day of the month and year in which they do it; and they shall be good against purchasers only from such signing. Where a person has acknowledged a judgment for the security of money, and afterwards, on borrowing more money of another person, mortgages his lands, &c. without giving any notice of the judgment to the mortgagee; in such case, if the mortgager do not within six months pay off and discharge the judgment, he shall forfeit his equity of redemption, 4 and 5 Will. and Mary. Acknowledging a judgment in the name of another person, without his privity or consent, is made felony by 21 Jac. I. c. 26.

JUDGMENT, *Action of Debt on*, lies for a person who hath once obtained a judgment against another for a certain sum, and who has neglected to take out execution upon it; such person, in his fresh action, shall not be put upon the proof of the original cause of action; but, after shewing the judgment once obtained, still in full force, and yet unsatisfied, the law immediately implies, that by the original contract of society the defendant hath contracted a debt, and is bound to pay it. This method seems to have been invented when real actions were more in use than at present, and damages were permitted to be recovered thereon; in order to have the benefit of a writ of *capias* to take the defendant's body in execution for these damages, which process was allowable in an action of debt (in consequence of the statute 25 Edw. III. c. 17.), but not in actions real. Wherefore, since the disuse of these real actions, actions of debt upon judgment in personal suits have been partly much discountenanced by the courts, as being generally vexatious and oppressive, by harassing the defendant with the costs of two actions instead of one. Blackst. Com. b. iii.

JUDGMENT, *Arrest of*. See ARREST.

JUDGMENT, *Assigning false*. See ASSIGN.

JUDGMENT *of God*. See JUDICIUM DEI.

JUDGMENT, *Execution of*. See EXECUTION, &c.

JUDGMENT, *Mass of*. See MASS.

JUDGMENT, *Property by*. A judgment, in consequence of some suit or action in a court of justice, is frequently the means of vesting the right and property of chattel interests in the prevailing party. In this case we must distinguish between property, the *right* of which is before vested in the party, and of which only *possession* is recovered by suit or action; and property, to which a man before had no determinate title or certain claim, but he gains as well the right as the possession by the process and judgment of the law. Of the former sort are all debts and choses in action; as if a man gives bond for 20*l.*, or agrees to buy a horte at a stated sum, or takes up goods of a tradesman upon an im-

plied contract to pay as much as they are reasonably worth; in all these cases the right accrues to the creditor, and is completely vested in him at the time of the bond being sealed, or the contract or agreement made; and the law only gives him a remedy to recover the possession of that right, which already in justice belongs to him. But there is also a species of property, in which a man has not any claim or title whatsoever, till after suit commenced and judgment obtained in a court of law; where the right and the remedy do not follow each other, as in common cases, but accrue at one and the same time; and where, before judgment had, no man can say that he has any absolute property, either in possession or in action. Of this nature are such penalties as are given by particular statutes, to be recovered on an action *popular*; or, in other words, to be recovered by him or them who will sue for the same; in which case a suit and judgment at law are not only the means of recovering, but also of acquiring property. Another species of property, that is acquired and lost by suit and judgment at law, is that of *damages* given to a man by a jury, as a compensation and satisfaction for some injury sustained; as for a battery, for imprisonment, for slander, or for trespass. Here the plaintiff has no certain demand till after verdict; but when the jury has assessed his damages, and judgment is given thereupon, whether they amount to 20*l.* or 20*s.*, he instantly acquires, and the defendant loses at the same time a right to that specific sum. To this kind of property may also be referred all title to costs and expences of suit.

JUDGMENT, *Villainous*. See VILLAINOUS.

JUDICATURE, the quality or profession of those who administer justice.

In which sense judicature is a kind of priesthood. In France, officers of judicature are venal.

JUDICATURE is also used to signify the extent of the jurisdiction of the judge, and the court wherein he sits to render justice.

JUDICE—*Coram non Judge*. See CORAM.

JUDICIAL. See EXTRAJUDICIAL.

JUDICIAL *Astrology*. See ASTROLOGY.

JUDICIAL *Oratory*. See ORATORY.

JUDICIAL *Writ*s. See WRIT.

JUDICIALIS LEX. See LEX.

JUDICIARY *ASTROLOGY*. See ASTROLOGY.

JUDICIARY *Deposit*. See DEPOSIT.

JUDICIO FALSO. See FALSO.

JUDICIUM ASSISE. See ASSISE.

JUDICIUM *Crucis*. See Judgment of the Cross.

JUDICIUM *Dei*, *Judgment of God*, was a term anciently applied to all extraordinary trials of secret crimes; as those by arms and single combat, and the ordeals; or those by fire, or red-hot plough-shares; by plunging the arm in boiling water, or the whole body in cold water; in hopes God would work a miracle rather than suffer truth and innocence to perish.

“Si super defendere non possit, iudicio Dei, scil. aqua vel ferro, fieret de eo iustitia.”

These customs were a long time kept up, even among Christians; and they are still in use in some nations. See ORDEAL, WATER, COMBAT, DUEL, and CHAMPION.

Trials of this sort were usually held in churches, in presence of the bishops, priests, and secular judges; after three days fasting, confession, communion, and many adjurations and ceremonies, described at large by Du Cange.

JUDICIUM *Parium* denotes a trial by a man's equals, *i. e.* of peers by peers, and of commoners by commoners. In magna charta it is more than once insisted on as the principal bulwark of our liberties, but especially by chap. 29, that

no freeman shall be hurt in either his person or property, "nisi per legale iudicium parium suorum vel per legem terræ." And this was ever esteemed, in all countries, a privilege of the highest and most beneficial nature.

JUDITH, an apocryphal book, excluded by the Jews from the canon of the Old Testament, and so called, because Judith is the principal person to whose history the book refers. We shall first give a summary of the contents of this book, and then inquire into the time in which it was written, and state different opinions concerning the writer of it. Nebuchodonosor, king of the Assyrians, who reigned in Nineveh, having defeated Arphaxad, king of the Medes, and taken him prisoner, formed a design of extending his conquests, and for this purpose sent Holofernes with a powerful army, who became master of Mesopotamia, Syria, Lybia, and Cilicia. After these conquests, he took possession of Idumæa. Upon this the Israelites were alarmed, and taking possession of the hilly country, fortified their cities. The high priest, Joachim, or Eliakim, encouraged their exertions, and ordered them to confide in God, and to implore his succour. Holofernes expressed surprise at their vigorous preparations for resistance against his powerful army, and enquired of their neighbours, the Moabites and Ammonites, what force they could command, and what was the reason of their declining to submit to him. Achior, the chief of the Ammonites, informs him, that these people were sometimes protected, and sometimes forsaken by their God; adding, that if they had offended their God, he would deliver them into his hands; but if not, then God would defend them, and his whole army could not conquer them. Holofernes received this account with indignation, and ordered Achior to be carried to Bethulia, which he immediately besieged, intending to revenge himself of Achior, as soon as he had taken that place. Onias, the governor of Bethulia, made preparations for its defence; but the inhabitants, dreading the event of a prolonged siege, wished to surrender the place, and could scarcely be induced to continue their resistance for five days. It was in these critical circumstances, that Judith, said to be of the tribe of Reuben, daughter of Merari, and widow of Manasseh, both opulent and beautiful, resolved upon going into the camp of Holofernes, in order to destroy him. Accordingly she left the city, and was introduced to Holofernes. The conqueror was captivated by the charms of her person, entertained her with a sumptuous feast, and expecting to obtain a complete triumph over this beautiful and rich widow, indulged in drinking to excess. In the evening, Bagoas, the eunuch of Holofernes, who had introduced Judith, with her maid-servant, to the feast, shut up the chamber-doors and departed. Holofernes, overcome by the wine which he had drank, fell into a sound sleep. Judith availed herself of the opportunity, cut off the head of Holofernes with his own sabre, deposited it in her maid's bag, and taking advantage of the liberty that was allowed her to visit and leave the camp at pleasure, hastened back to Bethulia. When the head of Holofernes was displayed to view on the walls of the city, the besieging army of the Assyrians was seized with dismay, and fled in great disorder. The Israelites pursued them, killed many of them, and took possession of a very large spoil. Judith took occasion to sing a hymn to the Lord, to whom she consecrated the arms of Holofernes, and accompanied the people to Jerusalem to present their public thanksgiving for this signal deliverance. She returned afterwards to Bethulia, lived there to the advanced age of 105 years, and was buried with her husband in this city. The people lamented her death for seven days; and the day

on which this victory was obtained was reckoned by the Hebrews among their festivals.

The greatest difficulty in this narration is to fix the time, when the event, which it records, happened. Some place it before, others after the captivity; and some finding insuperable difficulties in reconciling it with the history of the Jews, Assyrians and Medes, have maintained, that it is only a parable and allegory, and not a true history. The Greek and Syriac versions seem to prove, that it occurred after the captivity of Babylon. The Vulgate may be explained as referring to the time preceding the captivity. Neither sacred nor profane history, in the time of Manasseh, or in that of Zedekiah, either before or after the captivity, say any thing of a king of Nineveh, named Nebuchodonosor, who in the 12th and 17th years of his reign conquered a king of the Medes, called Arphaxad. It would also be hard to find at this particular time an high-priest of the Jews, whose name was Joachim or Eliakim. We should likewise meet with invincible difficulties, in reconciling the Greek text and the Syriac with the Latin of St. Jerom; nor would there be perhaps less, if we were to adhere only to the Vulgate, and reject the Greek, Syriac, and old Italic versions. If the names were granted, it is not easy to determine whether we should adopt the Greek or the Latin text. As to the Syriac, it was taken from the Greek, and from the Greek only one might infer, that the story of Judith was translated and written after the captivity; but if we follow the Latin, it may be placed before the captivity. The Greek text is very ancient: some suppose it to be Theodotion's, who lived under Commodus, after A.D. 180; but it must be more ancient, because it is cited by Clemens Romanus in his epistle to the Corinthians, written above 120 years before. The Syriac likewise is very ancient, and translated from some Greek text more correct than any we have at present; but the same as to substance. The Latin Italic version, or the old Vulgate, is made likewise from the Greek, but it is very defective. St. Jerom's Vulgate was translated from a Chaldee text, which St. Jerom took to be the genuine original of Judith; but he leaves the subject in a very perplexed and unsatisfactory state. With the old Latin version before him, he omitted what was superfluous; and reserved all that was found agreeing with the Chaldee, and probably added what was wanting, so that his version is rather a reform of the old, than a translation altogether new; and some words are observed in it which are taken from the old Italic. They who maintain, that the history of Judith contained what passed before the captivity, and in Manasseh's time, believe it sufficient to demonstrate, that there is nothing in the history repugnant to this assertion. The opinion, which places the history of Judith after the captivity of Babylon, is founded principally on the authority of the Greek version, which is certainly, as we have already said, very ancient; and it may pass for an original, there being nothing more ancient and authentic; for it is dubious, whether St. Jerom's Chaldee were the original text of this work. After all, what seems demonstrative for the opinion, which places this after the return from the Babylonish captivity, is the import of the Greek, chap. iv. 2. In this opinion almost all the ancients, and many of the moderns, have concurred. Eusebius places it in the reign of Cambyles, Syncellus in that of Xerxes, Sulpitius Severus in that of Oclius; others under Antiochus Epiphanes, and in the time of the Maccabees.

Dr. Prideaux supposes, that the Nebuchodonosor of the book of Judith is Saoduchinus, king of Babylon, who commenced his reign in the 31st year of Manasseh, and that Arphaxad

phaxad is Deioeces, king of Media; and that the destruction of Holofernes and his army at Bethulia took place in the 44th year of Manasseh, B.C. 655. He further supposes, on the authority of St. Jerom, that this book was originally written in the Chaldee language, and translated by Jerom into the Latin tongue, which is the translation that is now extant in the vulgar Latin edition of the Bible. The English translation, which we at present have among the apocryphal writings in our Bible, as well as the Syriac, was made from the Greek.

Whether the book of Judith be authentic and canonical is a point that has been very much disputed. The Jews read it in St. Jerom's time; St. Clement hath cited it in epist. 1. ad Corinth., as well as the apostolical constitution; Clemens Alexandrinus, Origen, Tertullian, St. Ambrose, and St. Jerom. Jerom says, in his preface to the book of Judith, that the council of Nice received it among the canonical books, though no canon was made to approve it. St. Athanasius, or the author of the Synopsis, gives a summary account of it. St. Austin, and the whole African church, received it. Pope Innocent I., and pope Gelasius, acknowledged it. The council of Trent hath also confirmed this book. The Romanists of course, having received this book into the canon of divine writ, hold the history recorded in it to be true. On the other hand, it is the opinion of Grotius, that it is wholly a parabolical fiction, written in the time of Antiochus Epiphanes, when he came into Judea to raise a persecution against the Jewish church; and that the design of it was, to confirm the Jews under that persecution, in their hopes that God would send them a deliverance: accordingly "by Judith is meant Judea; by Bethulia the temple or house of God; and by the sword which went out from thence, the prayers of the faints; that Nebuchodonosor doth there denote the devil, and the kingdom of Assyria, the devil's kingdom, pride; that by Holofernes is there meant the instrument or agent of the devil in that persecution, Antiochus Epiphanes, who made himself master of Judea, that fair widow, so called, because destitute of relief; that Eliakim signifies God, who would arise in her defence, and at length cut off that instrument of the devil who would have corrupted her." Many learned writers among the Protestants, though they do not adopt the peculiar fancy of this great man, agree with him in the general, that this book is rather a parabolical than a real history, designed for the instruction and comfort of the Jews under that figure, and not to give them a narrative of any thing that was really done; and their reason is, that they think it utterly inconsistent with all times, where it hath been endeavoured to be placed, either before or after the captivity of the Jews. Dr. Prideaux thinks that by putting it in the time of Manasseh he removes all the objections which are alleged to prove its inconsistency with the times after the captivity, which he thinks are unanswerable.

After examining a variety of objections relating to this book and its history, Dr. Prideaux concludes, "that if any one will still contend, that it is only a religious romance, and not a true history; that, according to the intention of the author, the scene of it was put under the reign of Xerxes, when Joakim, the son of Joshua, was high-priest, and the civil government of Judea, as well as the ecclesiastical, was in the hands of that officer; and that the inconsistency of so many particulars in that book, with the state and transactions of those times, was only from the ignorance of the author in the history of the said times, and his unskilfulness in placing the scene of his history in them; I

say, if any will insist on all this, notwithstanding what is above said, I shall not enter into any controversy with him about it: only thus much I must insist on, that if it be a true history (which I am inclined most to think, though I will not be positive in it), it can fall no where else but in the time where I have laid it."

The author of the book of Judith is unknown. St. Jerom seems to think that it was written by Judith herself; others imagine, that the high-priest Joachim or Eliakim, mentioned in this book, was the author: but all this is mere conjecture. Those who believe that the history of Judith happened in the time of Cambyfes, and after the captivity of Babylon, suppose that Joshua, the son of Josedek, then high-priest, wrote it. The author, whoever he was, does not appear to have been contemporary with the transactions. He says, that Achior's family was still in his time subsisting in Israel, Judith, xiv. 6. and that the festival instituted in memory of Judith's victory was still celebrated, Judith, xvi. 31. Dupin on the Canon. Prideaux's Conn. v. 1. Calmet.

JUDOIGNE, in *Geography*. See JODOIGNA.

JUDOMA, a river of Russia, in the government of Irkutsk, which joins the Maia, N. lat. 58 50'. E. long. 134° 14'.

JUDOOK, a town of Bengal; 18 miles N. of Dacca.

JUDOSA BAY, a bay of Louisiana, which lies in the N.W. corner of the gulf of Mexico; connected by a chain of islands towards the S.W. with St. Bernard's bay.

JUEFRAS, a town of Africa, in the kingdom of Barra.

IVEL RIVER, in Bedfordshire, is navigable from Tempsford to the town of Biggleswade: it does not appear, that any steps have yet been taken for extending this navigation up to Sheffield, agreeably to the act for that purpose, which passed in the 30th year of Geo. II.: the private interests of the merchants of Biggleswade seem a more effectual bar to the completion of this object, than the want of money, which has been so often insisted on.

IVELCHESTER and LANGPORT CANAL, is the parliamentary name of an inland navigation in Somersetshire, about seven miles long, from the Parret river, near Langport, to the town of Ilchester, made in pursuance of the act obtained in the year 1795. See CANAL.

IVENACK, a town of the duchy of Mecklenburg; 30 miles S.E. of Rostock.

IVERAGH. See KERRY.

IVERSKOI, a town of Russia, in the government of Novgorod; 80 miles S.E. of Novgorod.

IVES, SIMON, in *Biography*, was a lay vicar of St. Paul's cathedral, till driven thence by the republicans; when he became a singing-master, and a teacher of music in private families.

During the reign of Charles I., Ives stood high as a composer, as we are told in the MS. account of the masque intitled "The Triumphs of Peace," written by Shirley, a dramatist of the second class, which was acted at Whitehall in 1633, and the whole expence of the procession defrayed by the gentlemen of the four inns of court, as a testimony of duty and loyalty on his majesty's return from Scotland, after terminating the disorders of that kingdom.

A very circumstantial account of this masque by the lord commissioner Whitelocke, in his own hand-writing, has been preserved. It was the property of the late Dr. Morton of the British Museum. In this narrative, the commissioner, who was the principal manager of the exhibition, says: "I made choice of Mr. Simon Ives, an honest and able musician,

fitian, of excellent skill in his art, and of Mr. Lawes, to compose the airs, lessons, and songs for the masque, and to be masters of all the musick under me."

The compositions of Simon Ives are not devoid of merit; some of his rounds and catches, published in Hilton's collection, still live; "Come honest friends and jovial boys," &c.

In Playford's *Musical Companion*, and among the "Ayres and Dialogues" published in his time, there are several songs set by Ives, who died in 1662, in the parish of Christchurch, London.

Ives, *St.*, in *Geography*, is a populous borough, market and sea-port town, in the hundred of Penwith and county of Cornwall, England. It is situated near the north-east angle of a fine bay, which is bounded by bold rocks of black killas. The church is a low, but spacious building, having a nave and two aisles: from its situation near the shore, it is frequently covered, at high tides and tempests, with the spray of the sea. The chief articles exported from this town are slate and pilehards. The latter are in most seasons taken in the bay in great abundance; and at the time of large draughts, it is usual for all the inhabitants to contribute their assistance: the shops are then deserted; and if it should be Sunday, even the church is likewise abandoned. This port, as well as most others on the north coast, is greatly incommoded by the shoals of sand driven in by the north-west winds: and the town, as appears from Leland, has also suffered from the same cause. In the reign of queen Mary, St. Ives was governed by a portreeve and burgesses; but was not incorporated till the sixteenth year of Charles I., who confirmed some former privileges, vested the future government of the town in a mayor, recorder, twelve capital and twenty-four inferior burgesses, and granted the inhabitants four annual fairs, two weekly markets, Wednesday and Saturday, and also endowed a grammar school. Two members are returned to parliament from this borough: the right of election is possessed by the corporation, and all the inhabitants paying scot and lot; the number of voters being about 180. St. Ives is distant from London 275 miles: the number of houses was estimated, under the population act of 1800, as 540, inhabited by 2714 persons. *Beauties of England and Wales*, vol. ii. *Polwhele's History*, &c. of Cornwall.

Ives, *St.*, a market town and parish in the hundred of Hurlingstone, Huntingdonshire, England, is situated on the banks of the river Ouse. It was called, in the Saxon times, Slepe, and is mentioned by that appellation in the *Domesday* book: but it afterwards obtained the name of St. Ives from Ivo, a Persian archbishop, who is reported to have travelled through England, preaching the gospel, about the year 600. On the spot where the remains of this saint were reported to have been found, abbot Ednoth built a church; and soon afterwards, anno 1017, a priory was erected by earl Adelmur, who brought hither some Benedictine monks from the abbey of Ramsey. After the dissolution of monasteries, the site of this priory was granted, 36 Henry VIII., to sir Thomas Audley. The priory, barn, and dove-house are yet standing, but do not exhibit any thing worthy of notice. The parish church is a neat edifice; its spire has been twice blown down. The other places for religious worship in this town are, two meetings for Baptists, one for Quakers, and one for Presbyterians: the latter had its rise at the period of the civil wars of the seventeenth century, when the ejected minister of St. Ives was supported by the inhabitants in opposition to the reigning powers. Great part of the town was destroyed by a fire on the 30th of April 1689: it began in a malt-house at the end of White-hart-lane; and laid in ashes the dwellings and property of upwards of an

hundred families. The lower part of the town, from its vicinity to the river Ouse, has been frequently overflowed. Over the river is a stone bridge, with four pointed, and two semicircular arches. The charter for the market was granted by king Edward I. about the year 1290: it is held on Mondays, and is one of the largest in the kingdom for cattle, sheep, pigs, and poultry; being considered as second only to that of Smithfield in London. Here are also two well frequented fairs, held annually, at Michaelmas and Whitfuntide: the former sprung from an annual meeting appointed in 1020, to be held on the feast of St. Michael; the latter was granted by a charter of Henry I., dated in 1110, and was privileged to continue from "Whit-Monday till the Monday following, and all that day." Several breweries and malt-kilns are established in the town: the inns and public-houses are numerous. Many charitable donations are recorded on two tablets in the church, but the gifts are not large. St. Ives is 60 miles distant from London: the population, as returned under the act of 1801, amounted to 2099, inhabiting 478 houses. In the pits in the neighbourhood of this town, the cornua ammonis, belemnites, and other fossils, are occasionally found. *Beauties of England and Wales*, vol. vii.

IVETEAUX, NICHOLAS VAUQUELIN, in *Biography*, celebrated as a French poet, was born at Fresnaye, near Falaise, about the year 1559. His father, Vauquelin de la Fresnaye, was eminent for his poetry, and had the office of lieutenant-general of the bailiwick of Caen, which he readily made over to his son, but he was ill adapted to the duties of the situation, and after another change or two he was appointed preceptor to the duke of Vendome, natural son of Henry IV. He was next engaged in the same business with regard to the dauphin, afterwards Louis XIII., but not giving satisfaction, he was discharged with a pension and two abbacies. Thence, on account of some irregularities, he was obliged to resign, and then retired to a good house in the Fauxbourg St. Germain, where he adopted an epicurean life: after this he retired to a country seat in the diocese of Meaux, where he died, in 1649, at the age of ninety. The works by which he is known are "Institution d'un Prince," a poem written with force and solidity, and containing excellent lessons of morality: and "Stanzas, Sonnets, and other Poems." Moreri.

JUFFERS, among *Carpenters*, a term used for pieces of wood about four or five inches square, and of several lengths.

JUFOSTA, in *Geography*, a town of Arabia, in the province of Oman; 160 miles E.S.E. of El-Catif.

JUG, an earthen pot or pitcher to hold drink; also a term used in many parts for a common, pasture, or meadow.

JUGANG, in *Geography*, a town of Thibet; 30 miles E.N.E. of Zuenga.

JUGDALLIK, a town of Candahar, on the Kameh; 35 miles E.S.E. of Cabul.

JUGDEES, a town of Hindoostan, in Oude; 31 miles N.E. of Allahabad.

JUGDISPOUR, a town of Hindoostan, in Bahar; 15 miles S.W. of Arrah. N. lat. $25^{\circ} 27'$. E. long. $83^{\circ} 36'$.—Also, a town of Hindoostan, in Bahar; 8 miles S. of Bettiah. N. lat. $26^{\circ} 39'$. E. long. $84^{\circ} 51'$.—Also, a town of Hindoostan, in Oude; 44 miles N. of Manickpour.—Also, a town of Hindoostan, in Oude; 46 miles W.S.W. of Kairabad.

JUGERUM, a Roman measure, the double of the actus quadratus. It was a square of 120 Roman feet. The jugerum was divided into 12 unciae, and the uncia into 24 scrupula.

serupuke. Its proportion to the English acre is as 10,000 to 16,097.

JUGHIGOPA, in *Geography*, a town of Bengal; 27 miles E. of Ranganutty.

JUGK, a town of Prussia, in the province of Natangen; 10 miles N.W. of Liek.

JUGLANS, in *Botany*, so called by the Roman writers, on account of the excellence of the nut. It is contracted from *Jovis glans*, the acorn or mast of Jove.—Walnut-tree, Linn. Gen. 496. Schreb. 645. Willd. Sp. Pl. v. 4. 455. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 360. Juss. 375. Lamarek. Dict. v. 4. 500. Illustr. t. 781. Gærtn. t. 89. (Nux; Tournef. t. 346.) Class and order, *Monocotyledon Polyandria*. Nat. Ord. *Amentaceæ*, Linn. *Terebinthaceæ*, Juss.

Gen. Ch. Male, *Cal.* Perianth elliptical, flat, divided into six, depressed, concave, obtuse segments. *Cor.* none. *Stam.* Filaments from eighteen to twenty-four, very short; anthers oval.—Female, *Cal.* Perianth of one leaf, bell-shaped, four-cleft, erect, very short, single-flowered. *Cor.* of one petal, four-cleft, erect, acute, a little longer than the calyx. *Pist.* Germen inferior, oval, large; style very short; stigmas two, reflexed, jagged at the extremity. *Peric.* Drupa dry, oval, large, of one cell. *Seed.* Nut large, roundish, reticulated with furrows; kernel four-lobed, variously furrowed.

Eff. Ch. Male, Calyx depressed, six-lobed. Corolla none. Stamens about twenty. Female, Calyx four-cleft, superior. Corolla four-cleft. Styles two. Drupa with a furrowed lobed kernel.

1. *J. regia*. Common Walnut-tree.—Linn. Sp. Pl. 1415. Mill. Illustr. t. 81.—Leaflets about nine, oval, smooth, slightly serrated, equal. Fruit globose.—A native of Persia, and also of the northern parts of China. It flowers in the spring, and bears fruit in autumn. A large and handsome tree, with strong spreading boughs. *Leaves* pinnate, extremely fragrant; the end leaflet standing on a foot-stalk. *Male-flowers* in a clove, pendulous spike. *Females* scattered, frequently two or three together.—*Fruit* an ovate, smooth nut, containing a white, delicious, oily kernel, whose surface is rugged, and covered with a tough, yellowish skin.—The walnut-tree is universally known and admired for the splendour of its foliage, the delicacy of its fruit, and the utility of its wood.—There are many varieties of the species in question, well known to cultivators. It was formerly more propagated in Britain than at present, for its wood, which was in very great esteem, till the introduction of mahogany somewhat superseded its use, but is still in great request for furniture in various parts of the continent; with us it is valued chiefly for gun-stocks, the demand for which, of late years, has caused great devastation among our walnut-trees, a circumstance worthy the attention of persons who make planting an object either of pleasure or profit. The unripe fruit is frequently converted into a pickle or preserve.

2. *J. alba*. The Hickery, or White Walnut-tree.—Linn. Sp. Pl. 1415.—Leaflets seven, oblong-lanceolate, pointed, serrated, pubescent underneath; the odd one sessile. Fruit nearly quadrangular, smooth.—Native of North America.—*Leaves* composed of two or three pairs of oblong leaflets, terminated by an odd one, which is sessile. *Fruit* shaped somewhat like a common walnut, but the shell is not furrowed, does not split asunder, and is of a lighter colour.—Catesby describes this as a very large tree, with a trunk two or three feet in diameter, the leaves differing from the last not only in being serrated, but narrower, and more pointed. The shell is so very hard that it cannot easily be broken.

The kernel is sweet and well-tasted, affording a wholesome and pleasant oil.

3. *J. nigra*. Black Walnut-tree.—Linn. Sp. Pl. 1415. Jacq. Ic. Rar. t. 191.—Leaflets about fifteen, oblong-lanceolate, serrated. Fruit globular, roughish, dotted.—Found from Pennsylvania to Florida. It flowers in April and May. This is also a large tree. *Leaves* composed of six or seven pairs of leaflets, which are acute and serrated, emitting a strong aromatic flavour. Outer cover of the nuts rough; these are rounder than the common walnut. *Shell* hard and thick; kernel very sweet. The wood is the most valuable of all walnut-trees, being very finely veined, and capable of receiving a high degree of polish. There were large trees of the Black Walnut in Chelsea garden in 1759, which had produced abundance of fruit for upwards of forty years.

There are several other species of *Juglans*, chiefly, if not entirely, natives of America, all remarkable for the excellence of their wood. Willdenow enumerates eleven—professor Martyn eight.

Of these *J. cinerea*, the Ash-coloured Walnut, Jacq. Ic. Rar. t. 192. and *J. baccata*, the pulpy-coated walnut, figured in Sloane's Jamaica, t. 157. f. 1, are the only remaining Linnæan ones. Of the genus of the latter we presume there must be considerable doubt.

JUGLANS, in *Gardening*, comprises plants of the deciduous, hardy tree kind, of which the species mostly cultivated are, the common walnut-tree (*J. regia*); the white walnut-tree (*J. alba*); and the black walnut-tree (*J. nigra*).

It is remarked of the first sort by Martyn, that, as "they all vary again when raised from the seed, and that as nuts from the same tree will produce different fruit; persons who plant the walnut for its fruit, should make choice of the trees in the nurseries, when they have their fruit upon them."

The principal varieties are, the oval walnut, the round walnut, the large walnut, the small-fruited walnut, the double walnut, the early walnut, the late walnut, the tender-thin-shelled walnut, and the hard thick-shelled walnut.

Method of Culture.—It may be observed that all the sorts are capable of being increased by planting the seed or nuts, which in the first species should be of the best varieties when intended as fruit-trees, which, after they are become perfectly ripe, and have been preserved in dry sand till about the end of February, should be set either in slight drills, five or six inches apart in the rows, and a foot distant, or by the dibble, at the same distance, putting them into the depth of two or three inches, the ground having been previously well dug over. When the plants have had two years' growth in the seed-bed, they should be removed into nursery rows, shortening the tap roots, but preserving the tops entire, putting them at the distance of two feet and a half from row to row, and a foot and a half in the rows; they should remain in this situation till they have attained five or six feet in height, training them with single stems; after which they may be removed into the situations where they are to grow.

When the trees are intended for timber, it is a good practice to plant them out at once where they are to grow, as they thrive faster, and form better trees.

But in raising the walnut for fruit, Mr. Boutecher recommends flat-stones, tile-slabs, or slates, to be buried eight inches deep, under the nuts when they are set: the distance to be six inches, and the depth two inches. After two seasons, they should be removed early in autumn, and planted fourteen or sixteen inches asunder, on the same kind of bottom,

tom, or any hard rubbish, to prevent them from striking downwards, and to induce them to spread their roots on the surface. At the end of two or three years this should be repeated again, making the bedding at the depth of fifteen or sixteen inches, and planting them two feet asunder: here let them remain three or four years, when they will be fit to remove for the last time. The soil for fruit-trees should be dry and sound, with a sandy, gravelly, or chalky bottom. The trees managed in this way will have higher flavoured fruit, ripen earlier, and bear a plentiful crop twenty years sooner than in the usual method. The best manure for them is ashes, spread the beginning of winter, the land having been first ploughed or dug over.

And as plants raised from the nuts of the same tree bear fruit of very different qualities, he advises the sowing one of the best sorts on the common walnut-tree; by which method the planter is secure of his sort, and will have fruit in one-third of the time that he would obtain it from the nut. This method can, however, be practicable only in few situations. The length of time in which the walnut bears well from the nut, is about twenty years.

The nuts of the two other sorts are procured from America by the nurserymen.

Plants of the first sort are cultivated for ornament, as well as the nut or fruit which they afford. The fruit is used in two different stages of its growth; as, when green, to pickle; and when ripe, to eat the kernel. For the first purpose, the young green walnut, when about half or near three parts grown, before the outer coat and internal shell become hard, is most excellent; for which they are generally ready in July or the following month, and should be gathered by hand, choosing such as are as free from specks as possible.

The fruit is discovered to be fully ripe by the outer husk easily separating from the nut, or by the husks sometimes opening, and the nuts dropping out; it is usually about the latter end of September, which, in trees of considerable growth, is commonly beaten down with long poles; for, as the walnuts grow mostly at the extremity of the branches, it would, in very large spreading trees, be troublesome and tedious work to gather them by hand. As soon as gathered, they should be laid in heaps a few days to heat and sweat, to cause their outer husks, which closely adhere, to separate from the shell of the nuts; then be cleared from the rubbish, and deposited in a dry room for use, covering them over close with dry straw, a foot thick, where they will keep three or four months. They are always ready sale at market, in large towns, where, at their first coming in, they are brought with their husks on, and sold by the sack, or bushel, but afterwards cleaned, and sold both by the measure and the thousand.

Plantations of these trees are therefore profitable, in their annual crops of fruit, while growing, and in their timber, when felled or cut down.

These, as well as the other sorts, may many of them be admitted into clumps or plantations, in large pleasure-grounds, for variety. After one or two years, the other sorts are nearly as hardy as the first; but till that time should be protected against frosts in the winter season.

JUGLANS Regia, Common walnut-tree, in the *Materia Medica*. The unripe fruit has an altringent bitterish taste, and has been long used as a pickle. This is the part directed for medicinal use by the London college, on account of its anthelmintic virtues. Its effect in destroying worms seems to be confirmed by the testimony of several authors; and in proof of its possessing this vermifuge power, we are told that water, in which the green shells of walnuts have been ma-

cerated, on being poured in a garden, was found to drive all the earth-worms together as far as the water extended; and that the worms, by being immersed in a strong infusion of these shells, were immediately seized with spasms, and died in two minutes afterwards. An extract of the green fruit is the most convenient preparation, as it may be kept for a sufficient length of time, and made agreeable to the stomach of the patient by mixing it with cinnamon-water. This fruit, in its immature state, is also said to be laxative, and of use in apthous affections and sore throats. The Wirtemberg Pharmac. directs a rob for the above purposes to be prepared of its juice. The kernel of the walnut is similar in qualities to that of the almond and hazel nut, and affords an oil, which amounts to half the weight of the kernel. This oil is said not to freeze by cold, and to answer the medical purposes of the oil of almonds. Vinegar, in which walnuts have been pickled, has been found to be a very useful gargle. Woody. Med. Bot.

JUGLERS. See *PROVENÇAL Poets*.

JUGON, in *Geography*, a town of France, in the department of the North Coasts, and chief place of a canton, in the district of Dinan; 10 miles W. of Dinan. The place contains 408, and the canton 9911 inhabitants, on a territory of 147½ kilometres, in 8 communes.

JUGRAT, a town of Hindooistan, in the circle of Chanderee: 15 miles N. of Chanderee.

JUGULAR, among *Anatomists*, is applied to certain veins of the neck, which terminate in the subclavians. See *VEIN*.

JUGULAR *Vein*, how to puncture in bleeding. See *VENESECTIO*.

JUGULAR is also applied to certain glands in the neck, in the spaces between the muscles. See *GLANDS*.

JUGULARES, in the *Linnean System*, is the name of an order or division of fish, the general character of which is, that they have ventral fins before the pectoral fins, and ossiculated bronchiæ. This order comprehends six genera, viz. *callionymus*, *uranoscopus*, *trachinus*, *gadus*, *blennius*, and *kartus*; which see respectively.

JUGURTHA, in *Biography*, king of Numidia, was the natural son of Masinissa, one of the three sons of Masinissa, who, after the death of that prince, possessed the kingdom jointly. Micipsa, the survivor, and who inherited his father's kingdom, educated his nephew Jugurtha with his two sons Adherbal and Hiempsal; but as he was of an aspiring disposition, he sent him with a body of troops to the assistance of Scipio, who was besieging Numantia, hoping to lose a youth whose ambition seemed to threaten the tranquillity of his children. His hopes were frustrated, and Jugurtha returned with great glory, having also acquired the friendship of his general Scipio Africanus. Micipsa appointed him successor to his kingdom with his two sons, but the kindness of the father proved fatal to the children. Jugurtha caused Hiempsal to be assassinated, and stripped Adherbal of his possessions, and obliged him to fly to Rome for safety. The Roman people listened to the well-grounded complaints of Adherbal, but Jugurtha's influence prevailed among the senators; and the suppliant monarch, forsaken in his distress, perished by the snares of the enemy, and with every circumstance of cruelty. These atrocities excited such a flame at Rome, that the senate, in effect, declared war against Jugurtha. Cæcilius Metellus was sent against him, and by his firmness and success, the Numidian was forced to seek support from his savage neighbours. A variety of actions ensued, in which the Roman arms were mostly successful, though Jugurtha, skilfully pursuing the Numidian mode of warfare, did not cease to harass his enemies, and

oppose obstacles to their attempts. Marius and Sylla succeeded Metellus, and fought with equal success; at length they persuaded Bocchus, a Mauritanian king, who was in alliance with Jugurtha, and his near relation, to enter into negotiations of peace. By tempting offers he agreed to betray Jugurtha, and put him into the hands of his enemies: he was accordingly delivered up to Sylla, after a war of five years. Sylla carried him in chains to Cirta, whence he was sent to Rome in the year 106 B.C. and the joy testified on beholding him there in the condition of a captive, was a proof of the dread which he had inspired as an enemy. He was exposed to the view of the Roman people, and dragged in chains with his sons to adorn the triumph of Marius, after which he was insulted by the populace, and remanded to his dungeon, where he was either strangled or suffered to perish with hunger. He left two sons, who spent their days in captivity; and his dominions were divided between Bocchus, the remaining heirs of Massinissa, and the Roman republic. Sallust. Bell. Jugur. Universal History.

JUHOO, in *Geography*, one of the months of the Indus; 10 miles W. of the Ritchel.

IVIÇA, IBIÇA, *Ebusus*, the largest of the *Pityuse* islands. See PITYUSE.

This island is about 15½ leagues from the island of Majorca, which lies to the N.E. It is commonly said to be seven leagues long, and about 4½ broad in certain places, and 22 leagues in circumference. It is high, and covered with mountains, whose verdant declivities present an agreeable and picturesque prospect from the sea. The soil is adapted to every kind of culture. This isle is divided into five parts, or *quartones*, viz. the plain of the city, St. Eulalia, Balanzar, Pormany, and the Salines. The *Plain* of the town occupies a space of about 1½ league, and contains 200 houses, separated into little hamlets, the population of which is estimated at about 900 inhabitants. The canton presents on all sides well cultivated gardens and vineyards. The city furnishes a fort of militia, consisting of about 1120 men, for the safety of the district. The district of *St. Eulalia* has a territory of about four leagues in extent, bordering on those of Balanzar and Iviça, and lies to the N.E. of the latter. The number of houses is about 700, dispersed, without forming towns, villages, or hamlets. They are inhabited by 4000 persons, distributed in two parishes. A river, bearing the name of the Saint, flows at the foot of the mountain, where the spire of the church of St. Eulalia rises. The other parish is called St. John's. This district furnishes a contingent of 700 men for the security of the island. The territory of the district of *Balanzar* extends over about three leagues, and joins those of Iviça, St. Eulalia, and Pormany. The houses are reckoned at about 400, and the inhabitants may amount to 2200. The parish church is dedicated to St. Michael. The contingent for the safeguard of the island consists of 300 men. On the coast is situated the creek of Balanzar, near a mile in length. At the end is the little port of San Michela, which can only admit small vessels. This port is at the mouth of two rivulets, the sources of which are upwards of a league in the interior. The district of *Pormany* has a territory four leagues in length, bounded by Balanzar, Salines, and Iviça. The soil presents a fertile plain, on which are about 450 houses, containing at least 2000 inhabitants, and furnishing a contingent of 350 men. The principal church is consecrated to St. Antony, and its steeple, or turret, commands the port, and is guarded by two pieces of cannon, and some artillery men. The other church is dedicated to St. Joseph. The district of *Salines*, or las Salinas, takes its name from the salt found there, and is bounded by the districts of Pormany and

Iviça. It is two leagues in extent; the houses are reckoned at 150, and the population at 900 persons. The contingent consists of a company of 200 men. On a beautiful plain in this canton is situated the church of St. George. Port St. Antony, or Porto-magno, or Pormany, lies on the opposite coast. Iviça, though its mouth is difficult of entrance, is sufficiently spacious to accommodate a squadron; but in the winter season it is only fit for small vessels. The islanders of Iviça have criminal as well as civil laws peculiar to themselves. This island belongs to the Spaniards.

IVIÇA, the capital town of the above described island; which has a good port, situated to the S.E. below a small hill, under the cannon of a fortress constructed in the time of Charles V. Some ancient authors ascribe the foundation of this city to the Phœnicians, 663 years B.C. It was called *Pityusa*, because it is covered with pines and firs. Others attribute it to the Carthaginians, 70 years after Carthage was founded, alleging that the name *Ebusus* in the Punic language signifies arid. The Romans had it in their possession; it was afterwards occupied by the Moors; but the Africans were expelled by John, prince of Aragon, archbishop of Tarragona; and it has since remained under the spiritual jurisdiction of this city. The town, which is situated on a mountain, is honoured with the title of a bishopric, and it is also the seat of government. It has a cathedral, as many monasteries as parishes, one hospital, several churches, and some barracks. The town is well fortified, and has two entrances, viz. the New Gate, and the Principal. The suburbs, commanded by the cannon of the town, contain one church, called St. Elmo, well filled with failors. The port, though spoiled by the mud, is large enough to contain a squadron; it is the largest, most convenient, and best sheltered in the island. The N.E. wind is the only one from which it is not protected. The English took possession of this port in 1706; but the Spaniards have again obtained it. The governor has an assessor, and some other persons, who assist him in taking cognizance of all civil, criminal, and military matters, from whom the appeal lies to the captain-general of Majorca. Including the inhabitants of the suburb, the population is estimated at 800 families, comprehending 3600 persons. N. lat. 38° 58'. E. long. 1° 22'.

JUICE, a liquid substance, which makes part of the composition of plants; being diffused among all the solid parts, and serving for their nutriment and growth.

The juice, or sap, is that to plants, which blood is to animals.

There are juices of divers kinds, *aqueous*, *resinous*, *oleaginous*, *gummosus*, *resinous*, and *bituminous*; and of all tastes and colours.

JUICE, *Spanish*. See LIQUORICE.

JUICE is also applied to fœtal, and even to all, the fluids, or humours, in an animal body.

JUICE is also applied to the vapours and humidities inclosed in the earth.

JUICES, *Concrete*, in *Mineralogy*, a name given by many authors, to such substances found in the bowels of the earth, as have once been in a state of fluidity, and are capable of being rendered fluid again by art, by means of heat, moisture, or common agents.

Others apply the word *concrete* to all those substances which may be separated from fluids by chemical operations, whether they are afterwards soluble in them again or not; such are the particles of spar, separated from water by a slow distillation, and remaining at the bottom of the vessel.

The concrete juices of the earth are supposed to be the principal

principal things which give the virtue to mineral waters; for those which receive no concretion, and are only mingled with the waters in their passage through that part of the earth where they are evaporated, on the water's being exposed to the air, though they may give a briskness to it, while entire in it, yet are not to be supposed to give the principal virtues. These fluid and volatile juices all fly off in the analyses of the waters, but the concrete juices are more permanent, and leave certain sediments which render them visible and palpable, after the distillation of the waters with which they are mixed. When these happen to be simple, and of the same species with those known in a solid state, it is easy to deduce the virtues of the waters from them, and to know what must be the effect of such fluids as carry spar, sulphur, vitriol, or other well-known substances, into the blood; but it seldom happens that these things are thus contained simple and entire in the waters, they are often blended variously with one another, and often not the whole of the known body is contained, but the principles that constitute some part of it, such as the acid of vitriol without its metalline part, the basis of sea-salt without its acid, and so of the rest.

Salts and earths are evidently the most sensible and the most common matters which are mixed with water, and it is from them in general that the medicinal springs take up their virtues. There is scarcely any earth that does not contain some sort of mineral salt, capable of being washed out by water, though it be generally in imperceptible quantities; but where the earths are richer in these salts, the waters not only take them up, but carry also with them the several finer particles of the earth itself, in which they are bedded, and rising up at some small distance from the place, they make medicinal springs, of virtues answerable to the peculiar species of the salt that was lodged there. We are always able to separate, by analysis, the salts and the earths of the mineral waters; but when we have done this, we are not arrived at the end of the task, for they are often such mixed substances, that we can neither know them perfectly as they are, nor separate them.

The four most known and frequent of those concrete juices which are called salts, are alum, nitre, vitriol, and culinary salt; but the examination of the waters of different medicinal springs shews us, that there are in the earth others very different from these, and that perhaps in great numbers. There is in Asia a native alkali salt, or natrum, and in all the mineral waters we celebrate, there is a peculiar salt separable by evaporation, which is more nearly allied to this than to any of the other four, to one or other of which it has been the custom to reduce all salts; and yet different even from this in some respects. Besides this, those juices of the saline kind, whose disposition to concretion is not yet finished, and whose state is, as it were, but in embryo, or the first stage of being, are not to be known, when separated from the waters to which yet they may have perhaps given virtues greater than the concrete, in what we call its more perfect state, might have given: nay, even those that are more formed, and are already concreted, or in a state capable of concretion, have not simple and homogeneous substances in each of the species. The salt that is called culinary salt, is observed to have two different portions mixed together; the one is condensed and crystallized by cold and in moisture, after the evaporation of a part of the water wherein this salt hath been dissolved; and the other will not be crystallized nor condensed, but by a total evaporation of the water. The portion of this salt that is crystallized by cold and in moisture, is the most sulphureous, and by its sulphureity it will mix itself with the sulphureous salt of

calced tartar resolved in a moist air, or in common water, without turbidness, and without coagulation; but that portion of this common salt which is not condensed but by the total evaporation of the water which had dissolved it, hath an acidity which instantly coagulates the salt of tartar dissolved, and all other salts in the same state which are sulphureous and nitrous. It is evident, that while this salt is in its embryo state, the one or the other alone of these two very different substances of which it is contained, may be mixed with the waters of a spring, and communicate virtues different from those which the whole body of the salt would have done. This salt also being procured by evaporation of the water, or by any other analysis of it, could not be known or referred to the common salts, and much less if in the earth, as may very easily happen, it should be united with some one of the constituent parts of some other salt, in the same disunited or unfashioned state.

The vitriol which in a moist air yields an efflorescence upon sulphureous marcasites, has likewise a juicy portion, condensable only by a total evaporation of its aqueous humidity; this is of a very acrimonious taste, of an unctuous substance, and easily runs to water in a moist air. This juicy portion of vitriol is very different from that which shoots and condenses in the fluid liquor, by means of the cold. These crystals are pure vitriol acid, austere, and on being mixed with the sulphureous and nitrous salts, a great quantity of earthy matter precipitates out of them; but the other portion will mix itself with these salts in solution, without turbidness or emotion, not having, like the former, that acidity upon which the sulphureous or nitrous salts can act; which is exactly contrary to what happens to common salt, of which the first portion is the most sulphureous, and the latter portion the most acid. Nitre is also, like the rest, composed of two different saline portions, the one more sulphureous, which crystallizes with the cold, and in moisture, and the other, which remains dissolved after all the crystals are obtained, and which cannot be obtained in a dry form, but by the evaporation of all the humidity. This is less sulphureous than the other part obtained in crystals, and has some acidity which the other has not.

The first embryos of mineral salts are nothing else but vapours or juices not concreted, but totally volatile or vaporable; of these some may be condensed, and in part fixed by the action of fire, or disengaged from their matrices, and made capable of concretion by means of the air, as is observed in certain nitrous, aluminous, and vitriolic salts. The sulphureous part, which is formed in the lime, made of certain hard stones burnt in the fire, which is generally allowed to be a species of nitre, has certainly its seminal being in these crude stones, and in that state of its being, is very different from that which we find after it has passed the fire, which, from cold and coagulative, changes into caustic and resolute. This cold and coagulative quality of this stony salt, in its first state, manifests itself sufficiently in the waters of certain rock springs, which are very limpid and cold, and breed cold and scirrhus tumours under the throats of those people who ordinarily drink them, as in the Alps, &c. See BRONCHOCELE.

The seminal matter of this salt then is wholly altered in its nature by fire, and is rendered sulphureous and caustic as nitre. Fire is able to exalt and alter the state of being of this salt, but it is no more able to produce it in these stones than in the shells of oysters, &c. of which also a lime is made, which yields a salt not more sulphureous than this. Du Clos, *Observ. sur les Eaux Miner.*

The seminal being of alum and vitriol must, in the same manner, exist in those substances out of which those salts

are extracted by water, after they have been calcined by fire, or exposed to a slower calcination in the open air. They are not found in these stones before these processes, yet it is sufficiently evident that the fire and air could not produce them, but could only exalt them there.

All these varieties to which the several mineral salts are liable in the different stages, and in which they may be absorbed together, and united by water under the earth, do not only render the judging of the mineral waters, which partake of them by analyses very uncertain, but even, in many cases, perplex and confound us, by the very means by which we hope to understand them.

JUICES, Mineral. Many countries afford these, and give marks by them of treasures that might be turned to great account, were the proper manner of assaying them known, which is by first properly reducing them to a dry substance, so as to come at the solid matter they contain. With a view to the discovery of metallic veins, the erection of salt-works, vitriol-works, alum-works, borax-works, and the like, the curious on this subject may find many excellent hints for farther discoveries in the close of Agricola's work, "*De Re Metallica*;" and the view is farther carried on by Boyle, Becher, Stahl, and Homberg. The Royal Academy of Paris have also given some hints that may be of use, in their *Memoirs*; and some practical things are recorded in the *Philosophical Transactions*. We have accounts in the *Philosophical Transactions* of white and thick fluids like cream, found in mines at very great depths, and containing mineral particles. The bottoms of our coal-pits sometimes afford this liquor in very large quantities. And some of the iron mines in Shropshire, particularly that called the White mine near Hales in that county, affords a great quantity of this sort of juice. It is thick as cream, white, and of a sweetish taste, but with a vitriolic twang behind it. This is contained in the nodules of iron-stone, which are here a sort of enhydri, very large, composed of thick crusts, and some of them holding near a hoghead of this sort of liquor. *Phil. Trans.* N^o 100. See **ENHYDROS**.

JUILLAC, in *Geography*, a town of France, in the department of the Correze, and chief place of a canton, in the district of Brives; 19 miles W. of Tulle. The place contains 2010, and the canton 9402 inhabitants, on a territory of 125 kilometres, in 10 communes.

IVINGHOE, is a market town and parish in the hundred of Cotflow, and county of Buckingham, England. It is situated on the declivity of a chalk hill, near the ancient Ikeneld-street, 35 miles distant from London, and consists of two streets, containing, at the time of the late population report of 1800, 78 houses, and 452 inhabitants. In the church, which is a handsome structure, is an altar-tomb, said to be that of a brother of king Stephen. A market was granted to this town in the year 1318: it is now held on Saturday; but it is so small, that it may almost be said to be discontinued. Here are two annual fairs. The parish of Ivinghoe is very extensive, being fourteen miles in length, and containing several hamlets. In one of these, St. Margaret's, which is about five miles distant from the town, are the remains of the monastery of Muresley, founded by Henry de Blois, bishop of Winchester, in the reign of Henry I. for nuns of the Benedictine order. At the dissolution the site was granted to sir John Dance: it has been lately sold by Mr. Catherall, in whose family it has been during several generations, to Mr. Mercer. The building was, in 1802, almost entire: the parlour and hall, which are of Tottenhoe stone, appear to be of the age of Henry VII. *Lytton's Magna Britannia*, vol. i.

IVIRA, in *Botany*, a Caribbean name for a species of

Sterculia, called by Aublet *Ivira pruriens*, Pl. Guian. v. 2 694. t. 279. See **STERCULIA**.

JUJUBE. See **ZIZIPHUS** and **RHAMNUS**.

JUJUI, in *Geography*, a river of South America, which rises W.N.W. of Omaguaca, which gives it name; but afterwards, being joined by several small rivers at St. Salvador, it is called Jujui. On the borders of the province of Chaco, it unites with the Vermejo in S. lat. 24° 50'. Its whole course is S.E. nearly 300 miles.

JUJUMORA, a town of Hindoostan, in the circar of Sumbulpour; 20 miles S.S.E. of Sumbulpour.

JUKAN, a town of Hindoostan, in Guzerat; 20 miles N. of Noanagur.

JUKUM, a town of the duchy of Courland; 32 miles E.S.E. of Goldingen.

JULE, in the *Musæ of the Ancients*, Athenæus, lib. xiv. a song for woollen manufacturers; but afterwards the same author says it is the name of one of the songs or hymns in honour of Ceres, and it was, in fact, a hymn sung by the Greeks, and after them by the Romans, in the time of harvest, in honour of Ceres and Bacchus, in order to render those deities propitious.

The word is derived from *ἰαλα*, or *ἰαλα*, *a sheaf*. This hymn was sometimes called *demitrule*, or *demitriule*, that is, the Iule of Ceres.

JULEP, or **JULAP**, *Julapium*, in *Pharmacy*, and derived, according to Menage, from the Arabic *gieulap*, or rather from the Greek *ζελαπιον*: Olearius derives it from *gulap*, a Persian word, signifying *rose-water*; is an easy, agreeable, extemporaneous potion prescribed to sick persons; usually composed of common water, or simple distilled water, with one-third or one-fourth its quantity of distilled spirituous water, and sweetened with sugar, or proper syrups. This is sharpened with vegetable or mineral acids, or impregnated with other medicines. Juleps are sometimes used as the ordinary drink in certain diseases, but more usually as a vehicle for other forms of medicines; serving chiefly to dilute, to correct the peccant humours, restore the declining force of the heart, and promote sleep.

In dispensatories, we have several different juleps; the principal of which are, the camphor julep, *julepum e camphora*. See **CAMPHOR**.

The *cordial julep*, which is made by mixing four ounces of simple cinnamon-water, two ounces of Jamaica pepper-water, volatile aromatic spirit, and compound spirit of lavender, of each two drams, and an ounce of syrup of orange-peel; and is given in the dose of two spoonfuls, three or four times a day, in disorders accompanied with great weakness and depression of spirits.

The *expectorating julep* is formed by mixing four ounces of the emulsion of gum ammoniac with two ounces of the syrup of squills. Two table-spoonfuls of this julep may be taken every three or four hours in coughs, asthmas, and obstructions of the breast.

Musk julep is made, by rubbing half a dram of musk, and half an ounce of sugar together, and adding gradually two ounces of simple cinnamon-water, and as much of pepper-mint-water, and also two drams of the volatile aromatic spirit. Two table-spoonfuls of this julep may be taken every two or three hours, in a low state of nervous fevers, hiccapping, convulsions, and other spasmodic affections.

The *saline julep* is prepared by dissolving two drams of salt of tartar in three ounces of fresh lemon-juice, strained; when the effervescence is over, add of mint-water, and common water, each two ounces, and of simple syrup one ounce. This julep removes sickness at the stomach, relieves vomiting,
5 promotes

promotes perspiration, and may be of service in fevers, especially of the inflammatory kind.

The *vomiting* julep is made, by dissolving four grains of emetic tartar in eight ounces of water, and adding to it half an ounce of the syrup of clove July-flowers. This julep may be given, in the beginning of fevers, in the dose of one table-spoonful every quarter of an hour till it operates.

JULEP, *Mephitic*. See PYRMONT Water.

JULETA, in *Geography*, a town of Sweden, in Sudermania; 35 miles N.W. of Nykioping.

JULFAR, or DSJULFAR, a town of Arabia, in the province of Oman, situated on a bay of the Persian gulf; 100 miles N.W. of Oman. N. lat. $26^{\circ} 3'$. E. long. 57° .

JULGANOO, a town of Hindoostan, in the Candeish; 46 miles E. of Burhampour.

JULGONG, a town of Hindoostan, in the circar of Auringabad; 15 miles S.W. of Auringabad.

IULI, or CATKINS, *Petrified*, in *Natural History*. Small fossil bodies are found in the chalk-pits, near the bottom of the chalk series in Cherry-Hinton, in Cambridgeshire, which Mr. Parkinson has described in the 1st volume of his *Organic Remains*, p. 456, and considers them as the iuli of the larch, or some other tree; Dr. Parsons having considered them as parts of the roots of some plant, both of which opinions we consider as very far from probable. Dr. Woodward, from observing the great accumulation of iuli, chives, or chaff of the buds of trees and plants, in the peat marshes of our low fen lands, in his edition to the 2d part of his *Natural History of the Earth*, p. 125, considers the same as an evidence that the Mosaic deluge happened in the spring season, as related: not considering that the floods of every spring and summer still bring down such floating bodies in the rivers, and deposit them on their banks and shores in the level parts of their course.

JULIA DOMNA, in *Biography*, second wife of the emperor Severus, was a woman of great accomplishments, a native of Emesa, in Syria, and daughter to Bassianus, priest of the sun. In early life she applied herself to the study of geometry and philosophy, and became as celebrated for her mental as her personal charms. She came to Rome, where her learning recommended her to all the literati of the city. At twenty years of age she married Severus, who, twenty years after this matrimonial connection, was invested with the imperial purple. Her accomplishments made very little impression upon the heart and character of her husband, who, after a time, became so jealous of her, that she thought it right, probably from a consciousness of guilt, and from a desire of safety, to withdraw from all public affairs, and occupy her time wholly in the study of letters. She was fully sensible of literary merit, and invited to her court men distinguished for literary reputation, and it was at her desire that Philostratus wrote the life of Apollonius Tyanæus. Her influence, after the decease of the emperor, was for a time productive of tranquillity and union between her sons Caracalla and Geta. She opposed the plan of dividing the empire, but her attempts were unsuccessful, and so far from being able to effect a fraternal union, she was obliged to be the witness of the murder of her favourite son Geta, stabbed in her own arms by the order of Caracalla. It is said she herself was wounded in endeavouring to ward off the fatal blow. She soon recovered from her grief, by the flattering attention paid to her by Caracalla, and by his placing her name along with his own in letters to the senate and people. Her influence could not prevent him from practising those follies and enormities which led to his ruin, and his death plunged her into the deepest affliction. Recovering from her grief, she hoped to share the government

with Macrinus, the successor of her son, and being disappointed in this she retired from court, and died in 217. It is generally admitted that she starved herself to death, but whether from the dread of Macrinus, or to free herself from the pains of a cancer, has not been ascertained. She had experienced all the vicissitudes of fortune: from an humble station she had been raised to greatness, only to taste the superior bitterness of an exalted rank. Gibbon. *Univer. Hist.*

JULIA, in *Ichthyology*, a name given by Salvian and Gaza, to the *ioulos* of the Greek, called *julis* by the Latin writers in general, and by the Italians, *danzellina*. It is a species of the *Labrus*, according to Artedi, and is distinguished by that author from the other fish of that kind, by the name of the variegated labrus of a palm long, and having two larger teeth in the upper jaw. See LABRUS *Iulis*.

JULIAN, FLAVIUS CLAUDIUS JULIANUS, in *Biography*, Roman emperor, the son of Julius Constantius, brother of Constantine the Great, was born at Constantinople in the year 331, and was six years of age at the time of the massacre of the collateral branches of the Flavian family, after the death of Constantine, from which only himself and his elder brother Gallus were saved. The young princes were extremely well educated; and being brought up in the Christian religion, were baptized, and admitted to some inferior ecclesiastical offices. Julian publicly read the Scriptures in the church of Nicomedia. Gallus was invested with the imperial purple as Cæsar, in the twenty-fifth year of his age; and though he behaved with fraternal affection to Julian, his general conduct was tyrannical and disgusting, and soon brought him to his end. (See GALLUS.) From the time that his brother was made Cæsar, Julian was freed from every restraint, and put in possession of ample patrimony. He had imbibed strong prepossessions in favour of the doctrines of Paganism, which were fostered by the lessons of some philosophers of the Platonic school. From Maximus he received a secret initiation into the mysteries of the science of theurgy. From his abandoning the principles in which he had been educated, he has obtained the title of "The Apostate." At the fatal catastrophe of his brother Gallus, Julian partook of this disgrace, and was kept some time at the court of Milan, an object of suspicion. At length he was allowed to retire to Athens, where he was confirmed in all his notions; so that there probably did not exist in the Roman empire a more ardent votary for Paganism than he. About the year 355, he was recalled from his studious retreat to court; was declared Cæsar, and married Helena, the emperor's sister. He was now employed in military enterprise, and in a short time made several expeditions, in which he humbled the pride of many kings, and recovered 20,000 captives. The rising reputation of Julian was regarded with envy and jealousy by the emperor, who, to prevent him from becoming dangerous, deprived him of the principal part of his army. By this, Julian was reduced to great distress: he was, however, determined to submit. He accordingly made his soldiers a speech from the tribunal, exhorting them to loyalty and obedience; and gave the officers a farewell entertainment. Their reluctance to quit a commander, to whom they were so much attached, was augmented by this interview; and in the night, the soldiers encompassed the palace, and saluted Julian as the emperor. The prince strenuously rejected the proffered honour; and by securing the doors, endeavoured to exclude his person from their tumultuary attachment. Till the third hour of the day he remained inflexible to their prayers, their reproaches, and menaces; when being informed, that if he wished to live, he must consent to reign, he complied with their

their wishes. He immediately addressed, in his own name, and that of the army, a letter to Constantius, acquainting him with the event, and soliciting the confirmation of the dignity of Augustus, but still acknowledging his supremacy as head of the empire, and offering to remain contented with the administration of the western provinces of Gaul, Spain, and Britain. Constantius received his communication like an offended sovereign, refused to admit his assumed title, and commanded him to return to his duty, with the rank which he formerly possessed. Julian now held him at defiance, and dispersed manifestoes justifying his conduct; of which one of the most characteristic still extant was an epistle to the senate and people of Athens, whom, as a philosopher, a scholar, and a worshipper of the gods of Greece, he seems to have regarded with peculiar respect. In his progress he was stopped by the resistance of Aquileia, held by the troops of Constantius; and the approach of that emperor, with his veteran legions, prepared a bloody conflict, which was happily prevented by the sudden death of Constantius on the confines of Cilicia. Julian, now in the thirty-second year of his age, entered Constantinople amidst universal acclamations, and was acknowledged the sole sovereign of the Roman empire. His elevation to supreme power made no alteration in his character: he was a philosopher on the throne, as far as that title is merited by strict temperance, disregard of idle pomp, and trifling amusements; the diligent employment of his time in active occupations, or the pursuit of mental improvement, and constant study to fulfil the duties of his station. The ruling passion of Julian was to restore the heathen religion in all its ancient splendour; and to this, in various instances, he sacrificed both policy and justice. He wrote an elaborate work against the truth of Christianity, of which some fragments only have come to modern times. An edict of general toleration was his first measure, which produced the re-opening of all the heathen temples, and the return of Christian sectaries, who had been banished by the late emperor. He endeavoured to render Paganism more respectable in the eyes of the public, by certain regulations for securing the morals of the priesthood. He invited to his court all the eminent philosophers, and men of learning of that persuasion; and he encouraged proselytes, by tokens of imperial favour. The restoration of the ancient temple of Jerusalem attracted the ambitious mind of the emperor, who flattered himself that the completion of the undertaking would be at least a specious argument against the faith of prophecy, and the truth of revelation. To accomplish it, he employed one of his ablest generals, and ordered the governor of Palestine to lend his most strenuous support in restoring the work of Solomon to its pristine beauty. But neither the power of an emperor, with the resources of an empire, nor the enthusiasm of a whole people, could effect the purpose. A commencement was made of this work; but the builders were interrupted by extraordinary irruptions of fire, which obliged them to abandon their undertaking. Though restrained either by prudence or temper from the violence of persecution, Julian systematically pursued measures calculated to degrade and depress the Christians. He treated them with the language of sarcastic contempt, deprived them of the management of charitable contributions, and levelled all the honours of sacerdotal rank. He forbade all Christians from acting as teachers of grammar and rhetoric, or the liberal arts; thus compelling their youth to remain uneducated, or to receive, with the rudiments of learning, impressions subversive of their faith. He excluded them from posts of trust and honour; and condemned them to make ample amends for the destruction of Pagan temples in the preceding reigns, and restitution

of lands and revenues, which had been converted to the use of their own religion. The love of military glory was another passion by which Julian was actuated; and the field which he thought most worthy of its indulgence was the Persian empire, long the rival and formidable foe of the Roman. When he crossed the Tigris, he burned his ships, that his soldiers might proceed with firmness and resolution. He defeated the Persians drawn up to oppose him, and pushed on to the gates of the capital. Misled by treacherous guides, he was presently reduced to a scarcity of provisions; and he found that the only means of safety for his army consisted in retreat. In the mean time, the whole force of the Persian empire was assembled, and clouds of light troops harassed the Romans on every side, while the main body of the Persian host advanced in formidable array. Julian performed every duty of a soldier and a general, partook in every fatigue and hardship, and was present wherever danger was most urgent. The attacks of the enemy were several times repelled: at length Julian was mortally wounded, fell senseless from his horse, and was conveyed from the field in a state which announced approaching death. Sensible of his situation, he pronounced a farewell speech to the surrounding officers, and directed the disposal of his private property; after which, he entered into a metaphysical discussion with regard to the nature of the soul. Exhausted by these efforts, he called for a draught of cold water; and as soon as he had swallowed it, calmly expired, on June 26th, 363. The character of no eminent person has been more differently represented by friends and enemies. Of his writings, which are composed in the purity of the Greek language, one of the most curious is entitled "The Cæsars," which, in the form of a fable, freely discusses the characters of the several emperors, his predecessors. He gives the decided preference to Marcus Antoninus, whom he made his model in his religious and philosophical quality, although in temper he was a very different man. The learned Spanheim gave an elaborate edition of his works in Greek and Latin, in folio, 1696. Julian's partiality for every thing Grecian had infused into his mind a love of liberty, and a sense of the natural equality of mankind; and he rejected with abhorrence the haughty title of "Lord," which the Romans had introduced in addressing the master of the empire. He also imitated the best of the emperors, in paying respect to the consular dignity, and obedience to the laws of the state. He frequently sat upon the bench as judge, and administered justice with great impartiality between the rich and the poor. He possessed sound ideas of legislation; and it is to the credit of his character, that, of the laws enacted during his short reign, fifty-four have been received into the codes of Theodosius and Justinian. Univer. Hist. Gibbon's Rom. Hist. vol. iii. and iv.

The most ancient proof of an instrument, resembling a modern organ, blown by bellows, and played with keys, very different from the hydraulicon, which is of much higher antiquity, is a Greek epigram in the Anthologia, attributed to the emperor Julian, who flourished about 364. We shall here give a literal translation of this epigram, which, though it contain no very beautiful or poetical images, will answer the historical purpose of ascertaining the existence of an instrument in the fourth century, which, in many particulars, resembled a modern organ.

We shall insert the original here, for the satisfaction of the learned reader, from the Anthol. lib. i. cap. 80. 8.

Ἀλλοῖον ὄργανον δοῦναι καὶ φυσῖν· ἵππε' ἀπ' ἄλλης
 Χαλκίης τάχα μᾶλλον ἀνεβλάστησαν ἀέθνης,
 Ἀγρίαι, ὃδ' ἀνέμοισιν ἰφ' ἡμετέροις δονούσας,
 Ἀλλ' ἴτο ταυρεῖνς παρθοῶν σπύλινος ἀίτης,

Νέβριον ὑπερῶν καλάνων ὑπὸ ῥίζαν ἰδίου.
Καί τις ἀνὴρ ἀγέμωχος ἔχων δοῦ δάκτυλα χειρὸς,
Ἰσται ἀμφαθῶν καίνιας συμβράδμονας αὐλῶν
Οὐδ' ἀπαλὸν σκιρτῶντες, ἀποθλίβουσιν αἰσὶν.

"I see reeds of a new species, the growth of another and a brazen foil; such as are not agitated by our winds, but by a blast that rushes from a leathern cavern beneath their roots; while a *robust* mortal, (*ἀγέμωχος*, a tall sturdy fellow, alluding to the force necessary to beat down that kind of clumsy *carillon* keys of this rude instrument of new invention,) running with swift fingers over the concordant keys, (the rulers of the pipes, *αὐλῶν*; literally *keys*;) makes them, as they smoothly dance, emit melodious sounds."

Nothing material is omitted in the version of this epigram, or rather enigma, upon the organ, though not a very ingenious one; for the word *αὐλῶν*, the *pipes*, discovers the whole mystery.

JULIAN Calendar, Epocha, and Period. See the substantives.

JULIAN Law. See **PAPIAN POPÆAN law.**

JULIAN Year. The Julian is the old account of the year, used and used in England till 1752. It is so called from its founder Julius Cæsar; and by that name is distinguished from the new, or Gregorian account, used in most parts of Europe. See **YEAR**.

JULIANS, in Botany. See **Dame's VIOLET.**

JULIEN, SAINT, des Menestriers, in Biography. M. Millot, in his History of the Troubadours, tells us, that William IX. count of Poitou, in one of his poems, after relating a particular adventure with a common woman in very free terms, and reflecting upon his *bonnes fortunes*, or favour with the ladies, thanks God and St. Julien for his success. "It was then," says M. Millot, "customary, such was the superstition of the times, for libertines to invoke heaven for success in their most profligate undertakings; and St. Julien was the particular saint and protector to whom they addressed themselves upon such occasions;" as, in higher antiquity, Mercury was the patron divinity of thieves.

This saint, in order to expiate an involuntary crime, is said to have made a vow that he would receive into his house all passengers who should be in want of a habitation, by which he obtained the title of the "Hospitable Saint," and was afterwards addressed as the patron of travellers, to whom prayers were made for a good lodging. "L'Oraison de St. Julien, et l'Hôtel de St. Julien," were afterwards used by the French in pleasantry, much in the same sense as with us, *dining with duke Humphrey*. But in the tales written in old French so early as the twelfth century, the allusion was more licentious. Boccace (Giorn. II. nov. 2.) speaks of the "Paternostro di San Giuliano," and makes Rinaldo, after a successful adventure with a female, return thanks to God and St. Julien: "Per la qual cosa Rinaldo Iddio, et San Giuliano ringraziando, montò a Cavallo." La Fontaine, who has translated this tale, calls it "L'Oraison de St. Julien."

JULIEN, St., in Geography, a town of France, in the department of the Jura, and chief place of a canton, in the district of Lons-le-Saulneir; 18 miles S. of Lons-le-Saulneir. The place contains 899, and the canton 7098 inhabitants, on a territory of 120 kilometres, in 29 communes.—Also, a town of France, in the department of the Côte d'Or; nine miles N.N.E. of Dijon.—Also, a town of France, in the department of the Lemane, and chief place of a canton, in the district of Geneva; five miles S.W. of Geneva. The place contains 750, and the canton 11,071 inhabitants, on a territory of 197½ kilometres, in 24 communes.—Also, a town

of France, in the department of the Rhône and Loire; 10 miles E.S.E. of St. Etienne.

JULIEN'S, St., Bay, a large bay, containing a port, on the coast of Patagonia. S. lat. 49° 8'. W. long. 67° 43' 30".

JULIEN en Champseur, St., a town of France, in the department of the Higher Alps; six miles N. of Gap.

JULIEN de Chaptueil, St., a town of France, in the department of the Upper Loire, and chief place of a canton, in the district of Le Puy; seven miles E. of Le Puy. The place contains 2151, and the canton 7448 inhabitants, on a territory of 152½ kilometres, in 7 communes.

JULIEN l'Ars, St., a town of France, in the department of the Vienne, and chief place of a canton, in the district of Poitiers; six miles E. of Poitiers. The place contains 281, and the canton 4997 inhabitants, on a territory of 207½ kilometres, in 13 communes.

JULIEN de Montagnier, St., a town of France, in the department of the Vaucluse, and chief place of a canton, in the district of Orange; seven miles S.E. of Orange.

JULIEN de Pouvancin, St., a town of France, in the department of the Lower Loire, and chief place of a canton, in the district of Chateaubriant; seven miles S.E. of Chateaubriant. The place contains 1401, and the canton 5676 inhabitants, on a territory of 212½ kilometres, in 5 communes.

JULIEN du Sault, St., a town of France, in the department of the Yonne; six miles N.W. of Joigny.

JULIERS, Duchy of, lately a country of Germany, but now annexed to France, and forming a part of the department of the Roer. This duchy was formerly bounded on the N. by the duchy of Gueldres, on the E. by the electorate of Cologne and the Rhine, on the S. by the territories of Blankenheim and Schleiden, and on the W. by the bishopric of Liege, the duchy of Gueldres, and the Meuse. The soil is fertile, producing corn in abundance, and yielding good meadow and pasture land; it furnishes a good breed of cattle and of horses. Wood is plentiful, and linen is manufactured. Near Eschweiler stone-coal is found. In this duchy are 26 towns, and about 11 free boroughs. See **ROER**.

JULIERS, a town of France, in the department of the Roer, and chief place of a canton, in the district of Cologne, situated on the Ruhr. It is said to have received its name from the Romans. The town is small but strong, and has a regular citadel. It has a church and a convent, and without the walls are a Calvinist and a Lutheran church. The place contains 2126, and the canton 12,639 inhabitants, in 28 communes. This town surrendered at discretion to the French troops in October 1794, after a severe battle between the Austrians and French. N. lat. 50° 54'. E. long. 6° 18'.

JULIFUNDA, a town of Africa, in the country of Dentila; 10 miles W. of Banisrile.

JULIO, a mountain of the Grisons, N. of the Upper Engadine; eight miles S.W. of Zulf.

JULIS, in Ichthyology, the name of a small fish, a species of the labrus, caught principally about Genoa, and sold in the markets, being a very delicately tasted fish. Its usual size is about the length, and a little more than the breadth of a finger. The males of this species are very beautifully painted. Their backs are green, and their heads have variegations of yellow and red. Its sides have very broad serrated lines of a fine gold yellow, and its back fin has several large spots of blue and red. They are fond of human blood, and will seize upon the legs of people who walk naked into the water. See **LABRUS Julis**.

JULIUS I. in Biography, pope, was a Roman by birth, and

and succeeded to the papal see on the death of Mark, in the year 337. At this period the celebrated Athanasius lived in a state of exile at Treves, but in the following year he was permitted to return to Alexandria by the emperors Constantine, Constantius, and Constans. This circumstance excited the alarm of the Arian party, who, at a council assembled at Antioch, got Athanasius deposed, and Gregory, bishop of Alexandria, appointed in his stead. But in the Roman council, Athanasius was pronounced innocent of the crimes alleged against him, and was admitted by Julius to his communion, as an orthodox pillar of the church. The orthodox party confirmed the acts of the council of Rome, and, in the height of their zeal, they introduced for the first time, and authorized the practice of appealing to the pope, in contested ecclesiastical concerns, of which the successors of Julius availed themselves in establishing the enormous spiritual tyranny, which, by degrees, they crested in the church. Julius died in 352, having sat upon the pontifical throne somewhat more than fifteen years. Two of the letters of this pope are extant, one addressed to the Oriental bishops, and the other to the people of Alexandria in favour of Athanasius.

JULIUS II. pope, formerly known by the name of "Julian della Rovere," nephew of pope Sixtus IV., was born in the year 1443. He is said to have been of very mean extraction, and to have followed for some time the occupation of a waterman; he was preferred by his uncle Sixtus to the see of Carpentras, and raised to the purple in the year 1471. By the same pope he was raised successively to other valuable bishoprics, and upon the breaking out of an insurrection in Umbria, his uncle gave him the command of the papal troops, which was an employment perfectly adapted to his genius. He put an end to the rebellion which gave him vast influence and power at Rome. In 1480 he took an active part in the elevation of Innocent VIII. to the papacy, and while that pontiff lived he was in high favour at the papal court; but during the popedom of his successor Alexander VI., thinking his life in danger, he retired into France, and attended king Charles in his expedition against Naples. In 1503 he was himself elected pope, in the stead of Pius III. who had held the sacred office only twenty-six days. He took the name of Julius II., and, being possessed of a bold and martial spirit, determined to extend the temporal empire of the church by the force of arms. The emperor Maximilian, with the kings of France and Arragon, endeavoured to depose him, but he frustrated their designs, and in the year 1508 the famous league of Cambray against the republic of Venice was concluded between the pope, the emperor, the king of France, and the king of Spain, which threatened the entire ruin of that state. Before Julius signed this league, his unwillingness to increase the power of either the emperor, or the French king in Italy, induced him privately to communicate the terms of it to the Venetian ambassador, at the same time offering not to confirm it, provided that the republic restored to him the cities of Rimini and Faenza. This proposal was most unwisely rejected by the Venetian senate, and Julius confirmed the league. The Venetians were wholly unable to withstand such powerful enemies, and being reduced to the greatest extremities, they were obliged to submit. The pope absolved them from the effects of the sentence of excommunication issued against them, and without hesitation granted leave to all the subjects of the church to serve under their banners. He now formed the design of driving the French out of Italy, and with this view he laid siege to Mirandola, which he entered in triumph in 1511, but fortune turning against him, he was driven to Rome. In the course of his journey he received the unwelcome intelli-

gence, that an order for the assembling of a general council at Pisa was posted up at Modena, Bologna, and other cities in Italy, and that himself was summoned to appear at it in person. To counteract their proceedings, of which he had reason to entertain apprehensions, the pope summoned a general council to meet the following year at Rome, pretending, by that measure, to have superseded the council convoked at Pisa. An end, however, was not put to the sessions of this council before a decree had been passed declaring pope Julius II. a disturber of the public peace, a fower of discord among the people of God, a rebel to the church, a public incendiary, a blood-thirsty tyrant, and as such suspended from all spiritual and temporal administration of the church, and forbidding the faithful thenceforth to acknowledge or obey him. In revenge, Julius excommunicated the king of France, laid his kingdom under an interdict, and absolved his subjects from their oath of allegiance. In May 1512 the council met at Rome, in opposition to that of Pisa, but during the fifth session, the pope was seized with an illness which proved fatal to him in Feb. 1513, at the age of seventy, and after a pontificate of between nine and ten years. Julius was a person of great abilities, courage, and resolution, but arrogant and of insatiable ambition; possessing the most extravagant passion for war and bloodshed; so that it was said of him, if he wanted the qualities of a good bishop, he had at least those of a conquering prince. He has been accused of every crime, but his faults have been probably much exaggerated. He was much less chargeable with nepotism than many preceding popes; for of the twenty-seven cardinals created by him, four only were in any degree related to him, and these were men of unblemished characters. He was an encourager of the arts of painting, sculpture, and architecture, and begun the erection of the magnificent church of St. Peter.

JULIUS III. pope, formerly known by the name of John-Maria del Monte, was a person of mean extraction, and born in Rome about the year 1488. His uncle Anthony del Monte was made a cardinal by pope Julius II., and thus had the means of raising his family from obscurity. Under his patronage John-Maria was educated for the church, and distinguished himself by his proficiency in literature and jurisprudence. By his uncle's influence he obtained an archbishopric, and afterwards filled various posts under the holy see. In 1536 he was created a cardinal by pope Paul III. who afterwards employed him on different legations. He acquitted himself so well in these employments, that he obtained the character of a person of vast application and uncommon abilities, and he recommended himself so powerfully to his holiness, that in the year 1545 he appointed him his principal legate in the council of Trent, and confided to him his most secret intentions. In February 1550 he was elected to the popedom, and took the name of pope Julius III. out of respect to the memory of the pontiff, who, by raising his uncle to the cardinalship, had laid the foundation of his good fortune. One of his first acts gave great offence to every decent person; he conferred a cardinal's hat, with ample ecclesiastical revenues, upon a youth of sixteen, born of obscure parents, and known by the name of Ape, from his having been entrusted with the care of an animal of that species, in the cardinal del Monte's family. Such an indecent promotion was regarded by the cardinals as a gross affront offered to their body, but when they reproached him for introducing such an unworthy member into the sacred college, who had neither learning nor virtue, nor merit of any kind: he asked them "what virtue or merit they had found in him, that could induce them to place him in the papal

papal chair?" The subsequent conduct of Julius corresponded with this shameful behaviour at the commencement of his pontificate. He gave himself up to the unrestrained indulgence of his desires, and spent his whole time, and the revenues of the church in amusements, dissipation, and licentiousness of every kind. He died in 1555, having held the papal see about five years. Moreri. Bower. Bayle.

JULKADDER, in *Geography*, a town of Hindoostan, in Bengal; 27 miles S. of Islamabad.

JULKANPOUR, a town of Hindoostan, in Guzerat; 50 miles N.W. of Amedabad.

JULLOMA, a town of Peru, in the diocese of La Paz; 50 miles S.W. of La Paz.

JULSIO, a town of Sweden, in Westmanland; 52 miles N.W. of Stroemsholm.

JULTOWKOW, a town of Poland, in the palatinate of Bracław; 5½ miles W.N.W. of Bracław.

IULUS, in *Antiquity*. See **IULE**.

IULUS, in *Botany*, an old name for the *amentum*, or catkin, of Linnaeus; but the word being now appropriated to a genus of insects, is laid aside by botanists.

IULUS, in *Entomology*, a genus of aptera, with the lip crenated and emarginated; feelers two, and filiform; body long, semi-cylindrical, and consisting of numerous transverse segments; legs numerous, being two on each side of every segment of the body. This is the definition of the genus, according to the Gmelinian system. Fabricius, to whom we are indebted for our knowledge of several new species, distinguishes it merely by the lip and antennæ; the first of which, he observes, is crenated and emarginate, and the latter moniliform: in addition to these peculiarities, the structure of the body, legs, &c. constitute a secondary character. The species are chiefly ascertained by the number of the legs.

Species.

OVATUS. Legs each side twenty. Linn. *Oniscus*, Gronov.

Inhabits the seas of Europe.

COMPLANATUS. Legs each side thirty; body flattish; tail pointed. Fabr. *Iulus complanatus*, Linn., Degeer, &c. *Scolopendra Iulacca*, Scop. *Iulus scolopendricus*, Pod. Mus.

Native of Europe. Linnaeus describes the antennæ of this insect as being clavated, which is the case, though slightly.

DEPRESSUS. Legs each side thirty; body flattish; tail rounded and entire. Fabr.

An Indian species of very large size, the head of which is brown, and the segments rough, grey, and prominent, each side. Lund.

STRIGMA. Legs thirty each side; body black, with a white dot each side on every alternate segment. Fabr.

Found at Tranquebar by Dr. Koenig. Its size is twice that of *Iulus complanatus*; the antennæ and legs are black; tail pointed and white.

TRIDENTATUS. Legs each side thirty-six; tail armed with three teeth. Fabr.

An American species, in the cabinet of Drury. The eighteen segments of the body grey, and each marked with a ferruginous dorsal dot; legs with two denticles at the base.

VARIUS. Legs seventy-eight each side; segments of the body black at the base, and white at the tip. Fabr.

A species of moderate size, which inhabits Italy. The head is black, with a white band in the middle; segments whitish, and having a fine or thin ferruginous margin; legs black.

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CRASSUS. Legs each side eighty. Linn.

Native of Asia. Pale, with a line of minute black dots each side; tail acute.

TERRESTRIS. Legs each side one hundred. Linn. *Iulus fasciatus*, Degeer.

Inhabits Europe. Don. Br. Inf.

CARNIFEX. Legs each side ninety-four; head and legs red; tail with a red line. Fabr.

Native of Tranquebar.

INDUS. Legs each side one hundred and fifteen. Linn.

Inhabits India.

SABULOSUS. Legs each side one hundred and twenty. Linn. *Iulo glabro*, &c. Ray.

Found on the nut in Europe.

FUSCUS. Legs each side one hundred and twenty-four. Linn.

An inhabitant of India.

MAXIMUS. Legs each side one hundred and thirty-four. Linn.

A large species found in South America.

IULUS, in *Ichthyology*, a species of *Cyprinus*; which see.

JULY, in *Chronology*, the seventh month of the year, during which the sun enters the sign Leo. The word is derived from the Latin *Julius*, the surname of C. Cæsar the dictator, who was born in it. Mark Antony first gave this month the name July, which was before called *Quintilis*, as being the fifth month of the year, in the old Roman calendar established by Romulus, which began in the month of March. For the same reason, August was called *Sextilis*; and September, October, November, and December, still retain the name of their first rank.

"Quæ sequitur, numero turba notata suo."

On the third day of this month the dog days are commonly supposed to begin, and to end on the eleventh day of August. See **CANICULAR Days**.

JULY Flowers, or *Gillyflowers*, in *Botany*. See **PINK**.

JULY Flower, *Clove*. See **DIANTHUS** and **PINK**.

JULY, Queen's Flower. See *Dame's VIOLET*.

JULY, Stock Flower. See **STOCK**, &c.

JUMANAH, in *Geography*, a river of Bengal, which runs into the bay, N. lat. 21° 34'. E. long. 88° 38'.

JUMANDAR, a town of Asiatic Turkey, in Natolia; 24 miles E.S.E. of Dagnizlu.

JUMBO, a town of Africa, in the kingdom of Kaffon; 5 miles N.W. of Kooniakary.

JUMBOOAH, a town of Hindoostan, in Guzerat; 5 miles S. of Broderah.

JUMCUNDY, a town of Hindoostan, in Vishapour; 11 miles W. of Calgala.

JUMDAY, a town of Bengal; 30 miles S. of Boghlpour.

JUMEAUX, a town of France, in the department of Puy-de-Dôme, and chief place of a canton, in the district of Issoire. The place contains 1106, and the canton 7525 inhabitants, on a territory of 122½ kilometres, in 10 communes.

JUMETTAS, or *YUMETTAS Keys*, a range of rocks or islets among the Bahamas, extending from the S.W. coast of the island of Yuma. N. lat. 22° 40'. W. long. 76°.

JUMGERBAD, a town of Hindoostan; 30 miles W. of Benares.

JUMILAMURKA, a town of Hindoostan, in the Carnatic; 25 miles N.N.W. of Ongola.

JUMILLA, a town of Spain, in the province of Murcia; 22 miles S.W. of Murcia. The town is small, but contains about 8000 inhabitants. It is situated at the entrance of a

large

large

large and magnificent valley, at the foot of the mountain on which its old castle stands. The streets are straight, long, and large, but unpaved; the houses are clean, though not splendid. It has an hospital under the title of the Holy Ghost, a convent of Franciscan monks, and two parish churches.

JUMILLAC, LE GRAND, a town of France, in the department of the Dordogne, and chief place of a canton, in the district of Nontron; 9 miles N. of Exideuil. The place contains 2424, and the canton 8056 inhabitants, on a territory of 215 kilometres, in 7 communes.

JUMMANAH, a town of Hindoostan, in Candeish; 10 miles N.E. of Peploud.

JUMMEEDY, a town of Bengal; 24 miles S. of Ghidore.

JUMMOO, JUMBO, or *Jumbhu*, a town of Hindoostan, and capital of a district in Lahore, to which it gives name. It is distant 42 coses from Bissooly, and 50 about N. by E. from Lahore. It is situated on the side of a hill, near the river Rauvee, and divided into Upper and Lower Towns. This place is a mart of considerable consequence. Various circumstances concurred to divert the trade of Cachemire or Cashmere to Jummo, and thus to render it a place of extensive commercial resort, where persons of all descriptions, under the protection and encouragement of its chief, experienced in their persons and property full security. The commodities, constituting the trade of Jummo and Cashmere, are transported by men, usually Cachemirians, whose burdens are heavy, two of them making the load of a mule, and the hire is fixed at the rate of four rupees for each carrier. The shawls, when exported from Cachemire, are packed in an oblong bale, containing a certain weight or quantity, which, in the language of the country, is termed a "bidding," enclosed in an ox's or buffalo's hide, and carried by the Cachemirian as a Scotchman carries his pack.

In 1770, the period of Runzeid Deve's death, Jummo sustained grievous loss; for one of his sons seized the government, put to death one of his brothers, who was intended by the father for his successor, and imprisoned another. The Seikse embraced this opportunity of invading Jumbo, from which they had before exacted a moderate tribute. The most valuable division of the Jumbo districts lay in the plain country, and formed a part of the Panjab. These were laid waste by the Seiks, under a pretence of giving assistance to the fugitive chief, who resorted to them for protection. N. lat. 33°. E. long. 74° 5'.

JUMMUCANDY, a town of Bengal, 20 miles S.W. of Moorshedabad. N. lat. 23° 56'. E. long. 88° 13'.

JUMNAH, a river of Hindoostan, which rises in Thibet, and passing by Delhi, runs into the Ganges at Allahabad.

JUMNEE, a town of Bengal; 20 miles W. of Noony.

JUMOTTO, a town of Japan, in the island of Ximo; 12 miles S.E. of Nangasaki.

JUMP, in *Mining*, is one among the very numerous appellations, which the dislocations of the strata have received from the practical miners of different districts. See our article **FAULT**.

JUMPER is the name for a long iron tool, with a steed chisel-like point, which they use in quarries and mines, for drilling, or boring shot-holes in rocks, which require to be blasted with gunpowder. Drill, nager, and gad, are other terms for this tool.

JUMUNDERAD, in *Geography*, a town of Sweden, in the province of Angermanland; 24 miles N. of Hernösand.

JUNAGUR, or **CHUNAGUR**, a city and fortress of Hin-

dooftan, in Guzerat; 170 miles S.W. of Amédabad. N. lat. 24° 50'. E. long. 69° 54'.

JUNASKA, one of the Fox islands, in the Pacific ocean. N. lat. 53° 26'. E. long. 189° 14'.

JUNAT, a town of Bengal; 13 miles N.E. of Rogo-natpour.

JUNCAGO, in *Botany*, Tourn. Inst. t. 142, so called from its resemblance to a *juncus*, or rush. See **TRIGLOCHIN**, Arrow-headed grass.

JUNCAL, in *Geography*, a sea-port of South America, in the country of Chili, situated on the coast of the Pacific ocean; 50 miles N. of Copiapo.

JUNCALAS, a town of France, in the department of the Upper Pyrenees, and chief place of a canton, in the district of Argeles; 12 miles S. of Tarbes. The place contains 400, and the canton 4572 inhabitants, on a territory of 102½ kilometres, in 18 communes.

JUNCAW, a town of Hindoostan, in the circar of Mohurunge; 25 miles N. of Harriourpour.

JUNCEAE, in *Botany*, Brown Prodr. Nov. Holl. v. 1. 257. See below.

JUNCI, the 13th natural order of plants in Jussieu's system, or the third of his third class. It is named from one of its principal, or leading genera, *Juncus*, the Rush, properly so called.

Jussieu's third class comprehends monocotyledonous plants whose stamens are inserted into the calyx or corolla. His definition of the present order is as follows.

Calyx (which, in some of the genera, we should, with Linnæus, term *corolla*) inferior, in six deep segments, (rather of six leaves,) either equal or unequal, the three alternate ones, in the latter case, being larger, and petal-like, or it is glumaceous, and akin to the husks of grasses. *Stamens* definite (except in *Sagittaria* and perhaps *Alisma*), mostly six, rarely three or nine, inserted into the lower part of the calyx. *Germen* superior, in some simple, with a single style; the stigma simple or divided; capsule of three cells and three valves; with many seeds, inserted into the partitions originating from the centre of each valve. In others the germens, still superior, are three or six, rarely indefinite, sometimes united at their base; styles and stigmas equal to them in number, as well as the capsules, which are single-celled, either distinct or united, either single-seeded and often not bursting, or many-seeded, separating into two valves at their inner edge, the margins of the valves, (or the partitions) bearing the seeds. Corculum (perhaps of all) in the fear of a horny albumen. Plants herbaceous. The radical leaves, as well as those on the lower part of the stem, alternate and sheathing; the upper and floral leaves often assuming the form of a spathe, and sessile. Flowers furnished with spathas.

The sections are four.

1. *Germen* solitary. Capsule of three cells. Calyx glumaceous.—This comprises five genera, all Linnæan, *Eriocaulon*, *Restio*, *Xyris*, *Aphyllanthes*, and *Juncus*, the last only properly answering to the character.

2. *Germen* solitary. Capsule of three cells. Calyx half petal-like.—Here are six genera, *Mnascum* of Schreber (which is *Rapatea* of Aublet), *Syena* of Schreber (Aublet's *Mayaca*), *Polia* of Thunberg, *Callisia*, *Cummelina*, and *Tradescantia* of Linnæus.

3. *Germens* several. Capsules as many, single-celled. Flower-stalks radical, umbellate or whorled, the umbels and whorls encompassed with a three-leaved involucre. Plants aquatic.—The genera are *Butomus*, *Damaconium*, *Alisma*, and *Sagittaria*.

4. *Germens* several (mostly three). Capsules as many, single-celled, sometimes united at their base. Flowers panicled

eled or spiked.—Here we find *Nedris* of Schreber (*Ca-bomba* of Aublet), *Scheuchzeria*, *Triglochin*, *Narthecium* (*Tofieldia* of Hudson and Smith), *Helonias*, *Melanthium*, *Veratrum*, and *Colchicum*.

This, nearly analogous to the *Tripetaloidæ* of Linnæus, is perhaps, on the whole, one of the least correct of Jussieu's orders. The order of *Juncea*, extracted from it by *Decandolle* and *Brown*, is much better defined, in consequence of the expulsion of *Rostio* and its allies on the one hand, and *Commelina*, &c. on the other, with the removal of other genera to their proper places.

JUNCI Lapidei, in *Natural History*, the name given by authors to a species of fossil coral, of the tubular kind, and composed of a congeries of small tubules, which are usually round and striated within.

JUNCKER, GOTTLÖB JOHN, in *Biography*, a learned physician, was born on the 3d of June, 1680, at Londerff, near Giessen, in Hesse. He pursued his medical studies at Marburg and Erfurt, and afterwards took the degree of M.D. at Halle, in the year 1718. He became subsequently a distinguished professor in this university, and attained a high reputation as physician to the public hospital. He died at Halle, on the 25th of October, 1759. His works, which are chiefly compilations, have been much esteemed, and are still occasionally referred to, especially as they contain the best and most compendious view of the doctrines of Stahl, which he espoused and taught. They are as follows: 1. "Conspectus Medicinæ Theoretico-practicæ, Tabulis 137 primarios morbos, methodo Stahlianâ tractandos, exhibens," Halle, 1718, 4to.;—2. "Conspectus Chirurgiæ, &c." *ibid.* 1721, 4to.;—3. "Conspectus Formularum Medicarum, &c." *ibid.* 1723, 4to.;—4. "Conspectus Therapiæ generalis, &c. Tabulis 20 methodo Stahlianâ conscriptus," *ibid.* 1725, 4to.;—5. "Conspectus Chemiæ Theoretico-practicæ in formâ Tabularum Representatus, &c. Tomus prior." *ibid.* 1730, 4to. This is an elementary work on chemistry, according to the principles of Becher and Stahl.—6. "Conspectus Physiologiæ," *ibid.* 1735, 4to.;—and 7. "Conspectus Pathologiæ," *ibid.* 1736, 4to. Juncker likewise published many academical theses on medical, chirurgic, and philosophical subjects. Eloy. Dict. Hist.—Gen. Biog.

JUNCO, in *Geography*, a river of Africa, which crosses the Grain Coast, and runs into the Atlantic; 90 miles E.S.E. of Cape Monte.

JUNCO, in *Ornithology*, the reed sparrow. See **EMBE-RIZA Schoeniculus**.

JUNCO is also used by Bellonius for a bird, seeming, by his description, the same with what we call the flint. See **TRINGA Cinelus**.

JUNCTIN, FRANCIS, in *Biography*, a mathematician of Florence, who flourished in the sixteenth century, and was for a time a Carmelite, but quitted his order, and going to France, abjured the Roman Catholic religion. He became a corrector of the press, and afterwards a manufacturer of paper, and a banker, by which avocations he gained a large fortune. He died about the year 1580. He was author of some arithmetical works, commentaries on the sphere of Sacrobosco, on the Reformation of the Calendar, and on the age of the Loves of Petrarch.

JUNCTIONS. Among the Hindoos, junctions or meetings of many things are deemed holy and mysterious; more especially the junctions of rivers. The junction of the day with night, the forenoon with the afternoon, &c. are duly revered, by strict observers, with appropriate prayers and ceremonies; but the junction of rivers, above all, are very mysteriously contemplated. An act performed there, be it ever so good, is rendered vastly more so by this holy loca-

lity. Widows who burn themselves with their husbands' corpse, always do it, where practicable, at the junction of two rivers: this horrid sacrifice is called *Sati*, which see. As well as this species of meritorious suicide the Hindoos recognize some others, and if performed at the confluence of rivers the merit of the act is greatly enhanced.

"One of the holiest spots of the Ganga (or Ganges) is where it joins the Yamuna (Jumna) below Delhi. A third sacred river, the Sarawati, is supposed to join them subterraneously, whence the junction is called *Triveni*, or the *three plaited locks*. Pilgrims here begin the ceremonies afterwards completed at Gaya. The confluence of rivers is a spot peculiarly dear to Hindoos; and this, more especially of the Ganga and Yamuna, is so highly esteemed, that a person dying there is confident of immediate beatitude, without risk of farther transmigration. Suicide is not only pardonable, but in some cases meritorious with Hindoos. Cutting one's throat at the above holy junction, is, in reference to its immediate result, an instance of the latter. (See **SUICIDE**.) Widows who become *sati*, or *pure*, by burning themselves with the bodies of their deceased husbands, which is generally done at the *sangam*, or confluence of rivers, perform an act of meritorious suicide. And all acts in themselves good, are rendered vastly better if done on such a spot." Moor's Hindoo Pantheon.

JUNCTURE, any joint, or closing, of two bodies. See **JOINT**.

JUNCTURE, in *Oratory*, is a part of composition, particularly recommended by Quintilian, and denotes such an attention to the nature of the vowels, consonants, and syllables in the connection of words, with regard to their sound, as will render the pronunciation most easy and pleasant, and best promote the harmony of the sentence. Thus the coalition of two vowels, occasioning an hollow and obscure sound, and likewise of some consonants rendering it harsh and rough, should be avoided; nor should the same syllable be repeated at the beginning and end of words, because the sound becomes hereby harsh and unpleasant. The following verse in Virgil's *Æneid* is an example of juncture:

"Arma Virumque cano, Troja qui primus ab oris."

JUNCULAM, in *Geography*, a town of the island of Java, on the S.W. coast; 55 miles S.S.W. of Batavia. S. lat. 6° 40'. E. long. 105° 15'.

JUNCUS, in *Botany, an old Latin word, *a jungendo*, say the etymologists, from the use of the plants which bear this name in joining or binding things together. The Rush.—Linn. Gen. 173. Schreb. 230. Willd. Sp. Pl. v. 2. 204. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 374. Brown. Prodr. Nov. Holl. v. 1. 258. Juss. 44. Tourn. t. 127. Lamarck Dict. v. 3. 263. Illustr. t. 250. Gærtn. t. 15. Class and order, *Hexandria Monogynia*. Nat. Ord. *Tripetaloidæ*, Linn. *Junci*, Juss.*

Gen. Ch. *Cal.* Perianth of six oblong, pointed, permanent leaves, inferior. *Cor.* none. *Stam.* Filaments six, (in *J. conglomeratus* only three), capillary, very short; anthers oblong, erect, the length of the perianth. *Pist.* Germen superior, pointed, triangular; style short, thread-shaped; stigmas three, long, thread-shaped, downy, inflexed. *Peric.* Capsule invested with the calyx, triangular, of three more or less completely divided cells, with three valves, the partitions from their centre. *Seeds* various in number, rarely solitary, roundish.

Ess. Ch. Calyx of six leaves, permanent. Corolla none. Capsule superior, of three valves, with one or three cells. Seeds several. Stigmas three.

The extensive and very natural genus of *Juncus* is commodiously enough divided into two sections; the first containing such as have leafless stems, the second those with leafy ones. Of the former Willdenow reckons fifteen species, of the latter twenty-five. This author has judiciously enriched his stock by adopting those indubitable, chiefly alpine, species, which Scheuchzer, Haller, Allioni and other alpine botanists had well defined, but which Linnaeus had, rather incautiously, huddled together under his *pilosus* and *campestris*. His Syst. Veg. ed. 14, contains only twenty-two in all. Lamarck has thirty-two. The *pallidus* of the latter, omitted by Willdenow, is very distinct, though near *articulatus*, found at Buenos Ayres. Its flowers are much fewer together than in *nodosus*, to which Lamarck suspected it might belong. Mr. Brown has added nine New Holland species, previously nondescript, to the catalogue, and we believe America affords several more.

Eight British species are found in the first section, fifteen in the second. Of the former may serve as examples,

J. acutus, Engl. Bot. t. 1614, a large and rigid spinous-pointed plant, found on some of our sandy sea-coasts, but rarely.

J. maritimus, t. 1725, much more common, and found not only in clean sand, but in muddy salt-marshes also, confounded with the former by Linnaeus, from which it differs in its more slender form, glaucous colour, and oblong capsules.

J. conglomeratus, t. 835, which is triandrous, and *effusus*, t. 836, are both extremely common in moist places, as is *squarrosus*, t. 933, on the most dry and barren sandy heaths.

The second section, with leafy stems, is much more various and remarkable. In the beginning of it we find a tribe whose leaves are internally cellular, with transverse partitions, so as to feel, and even to look, jointed. These are scarcely yet well understood, especially the American ones, to which the Linnaean *nodosus* belongs. Those of British growth have lately been well elucidated by the Rev. H. Davies in Tr. of Linn. Soc. v. 10. See Engl. Bot. t. 238, now called *acutiflorus*, t. 2143, *lampocarpus*, and t. 2144, *obtusiflorus*, all confounded by Linnaeus under his *articulatus*.—A more slender tribe succeed. *J. bulbosus*, t. 934, very improperly so called, from a bulbous-rooted species, *J. uliginosus*, t. 801, whose synonym was once referred to it. *J. bufonius*, t. 802, with a very compound slender stem, is common in watery places, and rather extraordinary in its genus for having only an annual root. *J. gracilis*, t. 2174, a new Scottish species, resembles it in general aspect, but is not so much branched, nor so leafy.

J. biglumis, t. 898, *triglumis*, t. 899, and *castaneus*, t. 900, are three rare and curious mountain kinds, the first in particular, a Lapland plant, extremely uncommon in Britain, and scarcely well known by some of our best botanists. It may however always be distinguished from two-flowered specimens of *triglumis*, by the flowers being placed one above another, not in the same plane.

The genus finishes with another very distinct tribe, whose copious broad leaves, and more or less paniced numerous flowers, with a shining brown, yellow, or brilliant white calyx, give their leading characters. Of these are the common *J. pilosus*, Engl. Bot. t. 736; the more rare *J. Forsteri*, t. 1293; the great *syriacus*, t. 737 (Willdenow's *maximus*); the beautiful *luteus* of Allioni, Villars Dauph. t. 6, common on the alps of Switzerland, Savoy, &c.; the elegant *niveus* found on the mountains of Italy, Switzerland, and some parts of Germany; and our common *campestris*, Engl. Bot. t. 672.

JUNDGEH, in *Geography*, a town of Asiatic Turkey, in the province of Natolia; 16 miles W. of Kintaja.

JUNDOO, a town of Bengal; 5 miles S. of Ghidore.

JUNE, the sixth month of the year, during which the sun enters the sign of Cancer. The word comes from the Latin *Junius*, which some derive a *Junone*. Ovid, in the sixth of his *Fasts*, makes the goddess say,

“Junius a nostro nomine nomen habet.”

Others rather derive it a *junioribus*, this being for young people, as the month of May was for old ones.

“Junius est juvenum, qui fuit ante senum.”

In this month is the summer solstice.

JUNERE, or JENCAGHUR, in *Geography*, a town of Hindoostan, in the country of Baglana; 122 miles W.S.W. of Aurungabad. N. lat. 19° 11'. E. long. 73° 59'.

JUNES, EL, a town of Morocco; 15 miles N.E. of Azamor.

JUNGDRAWBERG, a town of Prussia, in the palatinate of Culm; 20 miles S. of Dantzic.

JUNGERBAD, a town of Hindoostan; 35 miles W. of Benares.

JUNGERMANNIA, in *Botany*, a cryptogamic genus of plants, very numerous in species, as well as distinct in character, named by Ruppius and Micheli, who have been followed by all botanists since, in honour of Lewis Jungermann, Professor of Botany at Altdorf, and afterwards at Gießen, in the early part of the seventeenth century. He wrote catalogues of the wild plants found near those towns, as well as near Leipzig, his native place, and Frankfurt on the Maine. Haller says he left a fine *herbarium* of two thousand plants, which is still preserved at Altdorf. Of him it may justly be said, that the genus in question has preserved his name, rather than his merits, from oblivion; for those to whom it is familiar, commonly rather wonder than take any pains to inquire, who Jungermann was. Linn. Gen. 564. Schreb. 764. Mart. Mill. Dict. v. 2. Mich. Gen. 6. t. 5. Hedw. Theor. 83. t. 22, 23. Schmidel. Monogr. ann. 1760. eum tab. Juss. S. Lamarck Dict. v. 3. 278. Illustr. t. 875. (Lichenastrum; Dill. Musc. 479. t. 69—74.) Class and order, *Cryptogamia Algæ*, Linn. *C. Hepatica*, Schreb. Nat. Ord. *Algæ*, Linn. *Hepatica*, Juss.

Gen. Ch. Male, *Cal.* and *Cor.* none. *Stam.* Anthers aggregate, of an indeterminate number, in powdery heads, which are either stalked, sessile, or immersed in the substance of the frond.

Female on the same (rarely on a separate) plant. *Cal.* Perianth erect, tubular, truncate, variously erenate or jagged. *Cor.* Veil membranous, sessile, smaller than the perianth, somewhat globose, closed on all sides, crowned with the style, at length bursting at the top. *Pist.* Germen oblong, sessile, enclosed in the veil; style solitary, cylindrical, terminating the veil; stigma abrupt, tubular. *Peric.* Capsule elevated on a long, fleshy, very tender, pale, simple, cylindrical stalk, globose, of one cell, at length bursting into four equal, permanent valves, spreading in the form of a cross. *Seeds* very numerous, globular, adhering by spiral elastic fibres to the base, summit, disk or margin of the valves.

Obs. Several germens are often found in one perianth, though only one of them comes to perfection, the others withering at the base or sides of its veil.

Ess. Ch. Male, Anthers aggregate, in powdery heads. Female, Capsule of four valves, on a stalk rising from a tubular calyx. Seeds attached to elastic filaments.

Nothing

Nothing can be more elegant than the general habit of this genus, which is, in a manner, intermediate between the true Mosses, or *Musci*, and the other *Hepaticæ* and *Algae*. It is throughout highly vascular or cellular, exhibiting the appearance of fine internal reticulations, as in *Hookeria* and some other mosses; but the texture is commonly more tender and succulent than in that family. Some species emit an aromatic fragrance, like that of red cedar wood, very perceptible and delightful in groves, or the shady walks of gardens. The capsule is essentially different from that of the true mosses, in having no *operculum* or lid; but the singular character of the style terminating the veil, or corolla, is proper to both. Great ambiguity occurs in the botanical descriptions of the various species, from Linæus having termed the whole plant a frond, though he often inadvertently calls its segments leaves, *folia*, and speaks of the *stem*, as if the plant were a real *herba*, as in the *Musci*. On this subject the writer of the present article has long been at a loss to form a decided opinion, and in the descriptions of many *Jungermannia* in *Englisch Botany*, has given into the practice of Schreber and others, who use the terms leaves and stipulas, for what, according to the original Linnæan principle, are segments of the frond, leaflets, or scales. On mature deliberation, however, it seems best to keep rigidly to this last-mentioned principle. The stalks, and the leaflets, or segments of the fronds, will always be found homogeneous and inseparable. The apparent leaves are never thrown off like the real leaves of other plants, but are of one substance with the part that bears them. The *Jungermannia acaulis*, which constitute the last section of the genus, as *epiphylla*, Hedw. Theor. t. 21—23; *pinguis*, Engl. Bot. t. 185; *multifida*, t. 186, &c. have to all intents and purposes real fronds, not stems and leaves; and it would be offering great violence to nature to suppose some species of a genus to be frondose and others herbaceous. Some German writers indeed cut this gordian knot, by abolishing the term frond altogether; but against such a measure we must put in our decided protest. (See FROND.) Little difficulty will arise from calling the segments leaflets instead of leaves, and what have been termed stipulas, may, by the analogy of ferns, be safely named scales, *squamæ*. In Engl. Bot. v. 31. p. 223, we have suggested the propriety of terming the larger half of the leaflet, (in those species usually known by the appellation of auricled,) in Latin *lobus*, and the smaller one, or auricle, *lobulus*. This will be found very commodious in constructing neat specific characters. In English *leaflet* and *side-lobe* will be equivalent to those terms.

On all these particulars, and others, we have had frequent consultation with our able friend Mr. W. J. Hooker, whose attention to this genus has been very deep and minute, and who has undertaken to illustrate the British species in particular, with excellent figures and descriptions.

Our native species amount to above 60, though Hudson has but 30. The foreign ones are very numerous, but the greater part remain undescribed, except what professor Swartz has given in his *Prodrômus*. Mr. Archibald Menzies collected, at the Cape of Good Hope, Staten Land, the west coast of North America, and especially at Dusky Bay, in New Zealand, a profusion of new and magnificent species, of which he has favoured us with specimens, but he reserves to himself their description, which is anxiously expected by his friends. It is presumed that 150 *Jungermannia* might easily be reckoned up. Linnæus's Syst. Veg. ed. 14, has but 33 in all, but his herbarium contains many more. Dillenius was the first who laboured with much success to explain the species of this genus, though Micheli also bestowed no small pains upon them, but his figures are, in this

instance, not very expressive. Schmidel, in his *Teones*, has illustrated a few species so amply and accurately as to leave nothing to be wished. It is but justice to Mr. Sowerby to say, that the plates he has given of *Jungermannia*, in Engl. Bot. are as characteristic as most botanical figures of any kind.

A natural distribution of the species is still wanting. Linæus divides them into five sections.

1. *Fronds pinnate; leaflets turned to one side.* Of this the common *J. asplenoides*, Engl. Bot. t. 1788, and *bidentata*, t. 606, are examples.

2. *Fronds pinnate; leaflets with auricles, or stipulas (rather scales), beneath.*

See *J. nemorosa*, t. 607, which has auricles (side-lobes), and *reptans*, t. 608, which has scales.

3. *Fronds imbricated.*

Under this head are arranged *tamariscifolia*, t. 1086, *ciliaris*, t. 2241, and some other very fine species.

4. *Shoots imbricated on all sides, the leaflets scattered.*

To this belong *concinna*, t. 2229, and *trichophylla*, t. 2252. *J. rupestris* and *alpina* are properly established as a genus of real *Musci* by Ehrhart, under the name of *Andreaea*, *Andraea* of Fl. Brit. 1178. Engl. Bot. t. 1277, 1278, and 2162, and Hooker in Tr. of Linn. Soc. v. 10. 381.

5. *Without a stem, the fronds being simple.*

To this, as we have already said, belong *epiphylla*, *pinguis*, and *multifida*.

The intelligent reader will easily perceive the insufficiency and inaccuracy of these subdivisions, and the necessity of better. The difficulty lies in finding technical characters to mark natural sections. It is easy enough to arrange any natural objects by such characters artificially, without regard to their real affinities. S.

JUNGEVSKOI, in *Geography*, a town of Russia, in the government of Tobolsk; 56 miles S. of Kemscoi.

JUNGFRAU (probably from the Celtic *Jun-fra*, i. e. a place from which water descends), a mountain in the canton of Bern, in Switzerland, which, according to professor Tralles's trigonometrical survey, rises 12,852 feet above the level of the sea, and affords a spectacle, the sublime beauty of which is scarcely equalled by any other object of nature in the Alps. The middle part of this stupendous mass is more generally known by the above name; the cuneiform rock towards the right hand (when viewed from the Pfetsch mountain) is called the *Monk*, and the summit, covered by eternal snows, is called the *Jungfrau-beru*. The valley of Lauterbrunn, at the foot of this mountain, is too confined to allow the eye to seize the whole grandeur of the object before it; but from the neighbouring Pfetsch mountain it may be seen to the greatest advantage, together with the vast groups of other craggy mountains and glaciers with which it is connected.

We read in an article from Bern, in the *Moniteur* of 25th Aug. 1811, that, in the beginning of that month, two Swiss gentlemen have succeeded in ascending the summit of this stupendous mountain, an undertaking which, hitherto, has been deemed impracticable. After having spent three days and four nights on the snow and ice, and made some fruitless attempts, they have seen their endeavours crowned on the 3d of August, when they reached the summit, where they fixed a black flag. They intend publishing an account of this remarkable journey.

JUNGFRAU, SROU, a small island, about six miles in circuit, on the W. side of the gulf of Bothnia; it is high and rocky, and dangerous to navigators. N. lat. 61° 10'. E. long. 17° 10'.

JUNGERUN, *Jill*, another small island on the W. side of the gulf of Bothnia. N. lat. 61° 16'. E. long. 17° 9'.

JUNGHERAH, a small island in the river Ganges, on which is a seminary of Hindoo mendicants; 12 miles from Boglipoor.

JUNGIA, in *Botany*, so named by the younger Linnæus, in memory of Joachim Jungius, a learned German botanist of the 17th century. (See JUNGIVS.) Linn. Suppl. 58. Schreb. 589. Willd. Sp. Pl. v. 3. 2391. Mart. Mill. Dict. v. 2. Juss. 175.—Class and order, *Syngenesia Polygamia-segregata*. Nat. Ord. *Compositæ capitata*, Linn. *Cinrocephala anomala*, Juss.

Gen. Ch. *Cal.* Common perianth of many, somewhat spreading, linear, obtuse, channelled leaves, containing three or four flowers: partial longer, many-flowered, of many, nearly equal, oblong, channelled, obtuse, erect leaves. *Cor.* compound, of uniform, hermaphrodite, equal florets: partial of one petal, funnel-shaped; the tube dilated upwards; limb of two lips; the outer longest, revolute, linear, toothed at the extremity; inner deeply divided into two small, erect, acute segments. *Stam.* Filaments five, very short, inserted into the tube of each floret; anthers united into a cylinder. *Pist.* Germen inferior, linear, angular; style thread-shaped; stigmas two, revolute, obtuse. *Peric.* none, except the unaltered calyx. *Seeds* solitary, angular. *Down* long, sessile, feathery. *Recept.* clothed with scales, resembling the leaves of the calyx.

Eff. Ch. Receptacle chaffy. Common perianth containing three flowers. Florets tubular, two-lipped; the outer lip ligulate; inner deeply divided.

1. *J. ferruginea*. Linn. Suppl. 390. Gathered by Mutis, or some of his pupils, in New Granada. A tree or shrub, whose branches are round, clothed with soft down, of a rusty hue, at least in the dried specimen. *Leaves* alternate, remote, stalked, flat, rounded, bluntly five-lobed; heart-shaped at the base; hairy on both sides; lighter coloured beneath. The only leaf we have seen is two inches in diameter, but there is reason to think the lower ones may be much larger. *Footstalks* downy and rusty. *Panicle* terminal, large, repeatedly branched with downy stalks. *Flowers* in roundish clustered heads. *Florets* purple, encompassed with the long white down of the seed.

This plant is known in Europe by the single specimen in the Linnæan herbarium only, nor has any figure of it appeared.

JUNGILE, in *Geography*, a town of Hindoostan, in Benares; 20 miles S. of Bidzigur.

JUNGIPOUR, a town of Hindoostan, in Bengal, where the East India Company have a factory for raw silk; 20 miles N. of Moorshedabad.

JUNGIUS, JOACHIM, in *Biography*, an eminent mathematician, physician, and botanist, the son of a schoolmaster at Lubec, in Germany, was born on the 21st of October 1587. His mother was daughter to a clergyman of the cathedral church at Lubec. Jungius having unfortunately been deprived of his father very early in life (for he was stabbed one evening upon his return home from a convivial party), and being left with a slender patrimony, was obliged to depend almost entirely upon his own exertions for whatever knowledge and information he was anxious to acquire, the narrowness of his circumstances not enabling him to pass through the usual routine of a learned and philosophical education. Notwithstanding this obstacle, we are informed that, in his youth, he became a very subtle logician, and ingenious disputant. By a close attention to such studies he prepared his mind for that clearness of investigation and accuracy of judgment, which were so eminently conspicuous

in the works which he published at a more advanced period of his life. Selecting the study of medicine as a profession, he travelled, at the age of 30, over a great part of Italy, and visited many of the principal places in Germany. His great object in travelling was to become acquainted with some of the most distinguished physicians of that time, from whose company and conversation he hoped to derive much amusement and instruction. He had previously graduated at the university of Gießen A. D. 1607, at which time he was ranked first among his competitors in the list of honours, and he remained there a few years in the capacity of mathematical tutor. In 1624 he married Catharine, the daughter of Valentine Haffeman, a respectable citizen of Rostock, in Lower Germany, by whom he had no issue. She died in 1638, from which period he remained a widower. He had been chosen professor of physic at Helmstadt in 1625, which had led him to remove from Rostock; but, on account of the Danish war, he was obliged, soon after his appointment, to fly to Brunswick, where he resided for a short time, and practised as a physician. However, he soon returned to Helmstadt, till, in 1629, he was appointed rector of the school at Hamburgh.

Jungius seems to have eminently distinguished himself in the several studies of theology, medicine, mathematics, metaphysics, and botany, upon all which pursuits his opinions and observations are handed down to us in his writings, though the most famous part of his work, entitled "Doxo-seopix Physicæ Minores," is upon the last mentioned subject, botany. This book was first printed at Hamburgh, in 4to. A.D. 1662, and again, in 1679, under the care of Martin Fogel, with this additional title, "Præcipuarum opinionum physicarum." A copy of the former edition of this work is in the Linnæan library, having been presented to Linnæus by his pupil, professor P. D. Giseke, of Hamburgh. The botanical part of it, included in the third section of the second part, occupies about 100 pages. Here are to be found many judicious and acute rules for making distinct species of plants, as well as some curious remarks upon genera. Professor Jungius was also the first author who contended that trees cannot with propriety be separated from other plants with respect to their classification, though the honour of having first started this idea is often bestowed upon Rivinus, for till this time trees had been regarded as a superior kind of productions in the vegetable kingdom. Jungius preferred the discriminative marks afforded by the herbage in general, viz. the leaves, stalks, and flower-cups of plants to those which are taken from colour, taste, or smell. He was a great critic in botanical nomenclature; and constructed a variety of terms which agree with those of Linnæus. Many species of plants were judiciously separated and determined by him, which had before been entirely misplaced or confusedly arranged. He moreover detected the seed of certain plants which, till his time, were supposed to have been destitute of seed, especially in the genus *Salix*. His remarks upon botanical discrimination have been of considerable advantage to succeeding botanists, and many of his definitions are repeatedly made use of by our immortal countryman, Ray. What further test of his abilities is requisite? It has been said, with a view to detract from the fame of Linnæus, that the works of our author furnished him with many hints which he never acknowledged; but this is scarcely possible, for though their ideas accord in many points, yet there is reason to believe that Linnæus never saw the writings of Jungius till long after his own were published.

Much credit is due to the subject of our memoir for having been the first who projected and raised a literary society in Germany,

Germany, though this institution did not share a better fate than the one which had just before been found in this country (and which appears to have served for its model) by Hugh Latimer, Thomas Linacre, and others, for the purpose of discussing and illustrating Aristotle's philosophy. They both flourished but for a short period, though the Heunetic or Ereunetic society, as it was called, established by professor Jungius, was on a far more comprehensive plan than the other, and may indeed be considered as having, in some measure, embraced the same views with which the Royal Society was afterwards instituted in Great Britain. The fame of Jungius was originally diffused through this country by his noble pupil, the honourable Charles Cavendish, who appears to have studied under him at Hamburg. This gentleman was brother to the earl of Newcastle, who had the care of Charles I. when a youth.

After a long life, spent in the acquirement and diffusion of general philosophical knowledge, and having always manifested a strong attachment to the Lutheran church, professor Jungius departed this life on the 23d of September 1657, at the age of 70 years, and was buried in the church of St. John at Hamburg, where a handsome tablet was inscribed to his memory by his friend and pupil, Michael Kirsten. The following is a list of his works, as given by Martin Vogel, who edited the second edition of his "*Doxoscopia*."

Logica Hamburgensis. Hamb. 1638, in 8vo.

Geometria Empirica. Rostock. semel et Hamb. bis, in 4to.

Doxoscopia Physicæ Minores, sine Ifagoge Physica Doxoscopica. Hamb. 1662, in 4to.

Kurzer Bericht von der Didactica oder Lehrkunst Wolfgangi Ratichii, durch Christoph. Helvicum und Joach. Jungium. Gießen, 1614, in 4to.

Disputationes de naturali Dei cognitione: de potentiâ activâ: de loco Aristotelis, lib. 3. de cælo, t. 66: de figuris locum replentibus: de relationibus: de notionibus secundis: de demonstratione tritermina: de definitionibus, &c.

Haller's *Bibl. Bot.* Witten. *Memoriæ Philosophorum*, Franckfort, 1679.

JUNGKEN, JOHN HELFRIC, a physician, was born at Kalern, in Hesse, in December 1648, and was distinguished by his abilities during his early studies. He pursued his medical education at Marburg and at Heidelberg, and took the degree of doctor at the latter university in 1671. After this period, he spent many years in travelling in pursuit of knowledge, and finally settled at Frankfort on the Maine in 1689, and was appointed physician to the public hospital there in 1693. He obtained a high reputation and a most extensive practice, in the course of which, however, he published several works. He died, greatly regretted, on the 5th of January, 1726. His writings are now seldom referred to, and it will be unnecessary here to detail the long titles of them. They treated of every branch of the profession, but chiefly on chemistry and pharmacy; and his pathology was founded on the mathematical doctrines, especially those of Descartes. Eloy. *Dict. Hist.*

JUNGLEBARRY, in *Geography*, a town of Bengal; 50 miles N. of Dacca.

JUNGNAU, a town of Germany, and capital of a lordship belonging to the princes of Furstenberg; 14 miles W. of Buchau.

JUNGS HOUND, or *Head*, a cape of Denmark, on the E. coast of the island of Zealand. N. lat. 53° 7'. E. long. 12° 11'.

JUNIATTA, a town of America, in Pennsylvania, 5 miles W.N.W. of Huntingdon.—Also, a river of Pennsylv-

vania, which rises from two springs in the Alleghany mountains, and runs into the Susquehanna, 15 miles N.W. of Harrisburg.

JUNIEU, Sr., a town of France, in the department of the Upper Vienne, and chief place of a canton, in the district of Rochechouart; 15 miles W. of Limoges. The place contains 6046, and the canton 12,519 inhabitants, on a territory of 170 kilometres, in seven communes. N. lat. 45° 53'. E. long. 9° 5'.

JUNIOR, a town of Poland, in the palatinate of Bracław; 52 miles N. of Bracław.

JUNIPA, in *Botany*, the name of a tree of the Caribbee islands, and some other places, the fruit of which is said to yield a juice as clear as water, yet yields a fine violet-coloured dye, and being rubbed twice on the same place, makes it black. This tincture, it is said, cannot be got out by soap, or any other method of cleansing, but after nine or ten days disappears of itself. It is said also, by the same authors, that hogs and parrots, feeding on this fruit, have their flesh and their fat all tinged throughout of a violet colour.

JUNIPERUS, an ancient Latin name, of whose meaning or derivation no account is given.—Juniper. Linn. Gen. 531. Schreb. 705. Sm. Fl. Brit. 1085. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 413. Tournef. t. 361. Juss. 413. Lamarck. Illustr. t. 829. Gærtn. t. 91.—Class and order, *Diacia Monadelphica*. Nat. Ord. *Conifera*. Linn. and Juss.

Gen. Ch. Male, *Cal.* Catkin conical, consisting of a common receptacle, bearing three rows of three flowers each, with a terminal one; the base of each flower is a broad, short, incumbent scale fixed by a stalk to the common receptacle. *Cor.* none. *Stam.* Filaments (in the terminal flower) three, awl-shaped, united below into one body (in the lateral flowers scarcely perceptible); anthers three, distinct in the terminal flower, but in the lateral ones attached to the base of each scale.—Female, *Cal.* the scales of a catkin, fewer, imbricated, the upper ones at length fleshy and permanent. *Cor.* none. *Pist.* Germens three, imbedded in the uppermost scales; styles three, simple; stigmas simple. *Peric.* Berry fleshy, roundish, marked in the lower part with three, opposite, obsolete tubercles, the points of the coalesced scales, and at the top umbilicated with three teeth. *Seeds.* Nuts three, oblong, convex on one side, angular on the other; abounding with cells of turpentine on the outside.

Eff. Ch. Male, Calyx-scales of a catkin. Corolla none. Stamens three.—Female, Calyx-scales of a catkin, fewer, at length pulpy, united into a berry with three seeds.

1. *J. communis.* Common Juniper. Linn. Sp. Pl. 1470. Eng'. Bot. t. 1100. Woodv. Med. Bot. t. 95.—Leaves three together, spreading, tipped with a spine, and longer than the ripe fruit.—A native of open, hilly places on a calcareous soil, flowering in May, though by no means a common plant in Britain.—"This *shrub* is generally of humble growth, much branched, rigid, smooth, evergreen. *Juice* of the whole plant a kind of turpentine. *Wood* hard and durable. *Leaves* opposite, acroste, channelled, sharp-pointed, glaucous ab ve. *Catkins* diœcious, axillary. *Berry* globose, dark-purple, covered with a glaucous dew, sweetish and aromatic.—The alpine variety β is more humble in its growth, and more depressed, having broader leaves and rather oblong berries.—The bark of juniper is frequently converted into ropes, and it is well known that spirits, when impregnated with the essential oil of its berries, become Juniper water, or Gin.—Linnæus observes, in his *Flora Lapponica*, n. 376, that the Laplanders drink infusions of the Juniper-berries, as we do tea and coffee, and that the Swedes

Swedes prepare a beverage from them in great estimation for its diuretic and antiscorbutic qualities.—There is reason to presume that the Swedish variety of this shrub, which is much taller and more arborescent than our's, may be a distinct species.

Linneus enumerates nine species of this genus, and professor Martyn eleven, the most remarkable of which are the following.—*J. Oxycedrus*, the brown-berried Juniper, a native of Spain, the south of France, and the Levant.—The wood of this species is supposed to have been the famous cedar of the ancients, celebrated for its durability, of which some of their first statues were made, before the use of marble in this branch of art was known.—*J. virginiana*, a native of North America, the West India islands, and Japan.—The wood of this tree is celebrated for its very powerful fragrance, and for resisting the attacks of insects, being the well-known red cedar, used for lead pencils, and formerly in great request for wainscoting, and cabinet-work. Large trees of it are not uncommon in the older gardens and shrubberies of this country.—*J. bermudiana* is also a hardy tree with us. It is suspected that more species than one have been confounded under this or the last.—*J. sabina*, the common Savin, a native of the south of Europe, is sufficiently well known, and is a popular medicine in some female complaints, being also supposed to be powerfully capable of procuring abortion. It is commonly of humble growth, but sometimes forms a handsome dark evergreen bush three or four feet high. In Greece it is said to become a tree like a cypress, with a trunk a foot in diameter. Botanists are by no means correctly versed in the species of this genus, or the varieties to which they are subject.—*J. Lycia*, is with difficulty distinguished from the last; its shoots are however somewhat thicker, and its leaflets more acute and less clustered. It is a native of the south of France and the Levant.—The gum-resin *Olibanum*, of a strong smell, and bitterish pungent taste, is extracted from the Lycian cedar, and is supposed to have been used by the ancients in their sacrifices, being still employed in Catholic countries in their religious ceremonies, as incense.

JUNIPERUS, in *Gardening*, comprehends plants of the evergreen tree and shrub kinds, of which the species generally cultivated are, the common juniper (*J. communis*); the brown-berried juniper (*J. oxycedrus*); the Spanish juniper (*J. thusifera*); the Barbados juniper (*J. barbadensis*); the Bermudas juniper (*J. bermudiana*); the favin (*J. sabina*); the Virginian juniper, or red cedar (*J. virginiana*); the Phœnician juniper, or cedar (*J. phœnicea*); and the Lycian juniper, or cedar (*J. lycia*).

The sixth species has a variety with variegated leaves.

And the seventh species affords the Swedish or tree juniper, which rises to a very considerable height. Also the alpine or mountain juniper, which has the leaves broader and thicker, and the berries of a rather oval shape.

Method of Culture.—All these plants, except the fifth sort, may be increased either by seeds, layers, or cuttings; the latter methods are proper for the favin kinds.

The seeds or berries should be sown in beds of light earth, in the early autumn or spring, but the former is the better in light soils, in a warm sheltered situation, in the open ground, being well raked in. The beds should be kept perfectly clear from weeds, and the young plants be occasionally watered during the summer season. When the plants have had two years growth in these beds, and are become strong, they should be removed into nursery rows at two feet apart, and a foot or eighteen inches distant in the rows. They should remain in these situations till of proper growth to be planted out where they are to remain.

The layers of the young branches should be laid down at either of the above seasons, and, when well rooted, taken off, and planted in the nursery, in the same manner as the seedling plants.

The cuttings should be made from the young branches, and be planted in a shady border, in the latter end of summer, watering them occasionally till they have taken good root; when they may be taken up with earth about their roots, and be managed in the same manner as by the other methods.

The plants raised in these last ways seldom grow so upright, or to so large a size, as in the seed method.

The common upright and striped favins may likewise be increased by planting slips of the young branches; for the last sort the most variegated being made use of, in the latter end of summer, or in the autumn, in a shaded border, due water being given. When the plants are come up, they must be managed as the other sorts.

The fifth sort must be sown in pots or tubs, at the same seasons as the other sorts, being placed in a frame to have the protection of glasses when the weather is frosty and severe. As the seeds are long in coming up, the mould in the pots, &c. must remain undisturbed till they appear, being shaded from the sun, and slightly watered occasionally. The young plants should be kept quite free from weeds, and be duly watered till they have attained sufficient growth to be removed into separate small pots, filled with light earth, which is generally when from one to two years old. In removing them, they should have balls of earth preserved about their roots, and be watered, and placed in a warm situation. The best season for this is in the early spring: but it is of great advantage to plunge the pots in a mild hot-bed. They must be protected in the winter, either in frames, or under a warm fence; the pots being plunged in the earth. When they have been removed into different larger pots, till of sufficient large growth, they may be planted out where they are to grow, which should be in a warm situation. It is proper to shelter them the first two winters during severe frosts, by mats, or other similar coverings.

The proper periods for removing all the different sorts into the open ground are in the early autumn or spring months.

These plants all succeed in the open ground, and grow in any common soil and situation, with other hardy plants of the tree kind; though they are the most prosperous in a light sandy soil, where the aspect is sheltered.

In placing these kinds of plants in the clumps and shrubbery plantations, attention should be had to arrange them according to their degrees of growth, so as to exhibit a regular gradation of height; placing the low growing sorts, as the common juniper and favin kinds, towards the fronts, and the other larger growing sorts more backwards, in assemblage with other ornamental shrubs and trees of the evergreen tribe; and some may be placed as single standards, on open spaces of short grass, in the pleasure ground quarters. Some of the large growing sorts may also be introduced into the forest-tree plantations, as they have a fine effect, and afford excellent timber for many uses, more particularly the Virginia cedar, which arrives at a considerable size, especially when the under branches are trimmed off occasionally while young.

JUNIPERUS, in the *Materia Medica*. The tops and fruit or berries of the shrub juniperus, which is common on heaths in different parts of Europe, are much used in medicine; but the latter are preferred.

These berries, which are first green, and when ripe of a dark

JUNIPERUS.

dark purple colour, ripen in the autumn. They are chiefly brought to us from Holland and Italy; and should be chosen fresh, not much shrivelled, and free from mouldiness. Their smell is moderately strong, but not disagreeable, and their taste is warm, pungent, and sweetish, which, after they have been long chewed, or previously well bruised, is followed by a considerable degree of bitterness. The sweetness of these berries appears to reside in the juice, or soft pulpy part; the bitterness in the seeds; and the aromatic flavour in oily vesicles, spread throughout the substance, both of the pulp and of the seeds, and distinguishable even by the eye. The fresh berries yield, on expression, a rich, sweet, honey-like, aromatic juice; and if the seeds are thoroughly broken, the juice proves tart and bitter.

Juniper berries give out nearly all their virtue, both to water and rectified spirit, tinging the former of a brownish-yellow, and the latter of a bright orange colour. Distilled with water, they yield a yellowish essential oil, very subtle and pungent, resembling the berries in smell, and in quantity, when the berries have been sufficiently bruised, about one ounce from forty. This oil is a very stimulating diuretic; the decoction inspissated to the consistence of a rob or extract, has a pleasant, balsamic, sweet taste, with a greater or less degree of bitterness. A part of the flavour of the berries arises also in distillations with rectified spirit: the inspissated tincture consists of two distinct substances; one oily and sweet; the other tenacious, resinous, and aromatic. The extract may be used with advantage in cases where the more stimulating preparations would be improper; as in catarrhs, debilities of the stomach and intestines, and difficulties of the urinary excretions, in persons of an advanced age. Among the aromatics that have been tried in composition with juniper berries, sweet fennel seeds, and caraway seeds, seem the best adapted to improve their flavour. A cordial water is prepared in the shops, by drawing off a gallon of proof-spirit from a pound of the berries, and an ounce and a half of each of the seeds. To this water may be usefully super-added, a proper quantity of the rob. Lewis.

The berries are chiefly used for their diuretic effects; and they are also considered to be stomachic, carminative, and diaphoretic. We have several testimonies in favour of the efficacy of juniper berries in many hydropical affections by physicians of great authority; but authors do not seem to be perfectly agreed which preparation of the juniper is most efficacious; many preferring the rob or inspissated decoction; but Dr. Cullen observes, that this is an inert medicine, alleging that to the essential oil, which is much the same as that of turpentine, only of a more agreeable odour, he thinks all the virtues ascribed to the different parts of juniper are to be referred. Hoffman, on the contrary, strongly recommends the rob, and declares it to be of great use in debility of the stomach and intestines; and he found it to be particularly serviceable to such old people as are subject to these disorders, or labour under a difficulty with regard to the urinary excretion; whence it appears, that the berries retain medicinal powers, though deprived of the medicinal effects of the essential oil. Van Swieten prescribed the following formula: *R. Rob. bacc. junip. ℥ii; dilue in aqua junip. ℥ii; add. spirit. bacc. junip. ℥ii; quandoque spiritus nitri dulcis ℥ss ad sitim sedandam additnr.* Of this mixture one or two ounces were given every three hours. But juniper being now seldom or ever relied upon for the cure of dropsies, and only used in aid of more powerful remedies, it is justly observed by Duncan (New Ed. Disp.) that "perhaps one of the best forms under which the berries can be used is that of a simple infusion. This by itself, or

with the addition of a little gin, is a very useful drink for hydropic patients." Medical writers have also spoken of the utility of juniper in nephritic cases, uterine obstructions, scorbutic affections, and some cutaneous diseases; and in the two last-mentioned complaints, the wood and tops of the plant are said to have been employed with greater advantage than the berries. Our Pharmacopeias direct the essential oil and a spirituous distillation of the juniper berries to be kept in the shops: the former, in doses of two or three drops, is found to be an active and stimulating medicine; the latter contains this oil, and that of some other aromatic seeds united to the spirit, and therefore differs not considerably from the genuine geneva imported from Holland: but there is great reason to believe, that the gin usually sold here is frequently nothing but the frumentaceous spirit, imbued with turpentine, or other materials to give it a flavour. Woody. Med. Bot.

Etmuller had a high opinion of juniper berries. The rob made of the expressed juice of the green berries has been called by many, the *iberiaca Germanorum*; so much are they esteemed by that nation for their alexipharmic qualities.

The wood of juniper, it is said, will last a hundred years without corrupting; the chemists add, that a coal of juniper, covered with ashes of the same kind, will keep on fire an entire year.

From this juniper, the gum sandarachia is obtained: it exudes through the crevices of the bark, or the perforations made by insects.

The bark of the *Juniperus Lycia* yields the official gummy resinous substance, called Olibanum. See FRANKINCENSE and OLIBANUM.

The *Juniperus Sabina*, or common savin, is a native of the south of Europe and the Levant: it has been long cultivated in our gardens; and from producing male and female flowers on separate plants, it was formerly distinguished into the barren and berry-bearing savin. The leaves and tops of savin have a moderately strong smell, somewhat disagreeable, and a hot, bitterish, acrid taste: they give out part of their active matter to watery liquors, and the whole to rectified spirit. Distilled with water, they yield a large quantity of essential oil. From thirty-two ounces Hoffman obtained five ounces of this oil, in which the whole virtue of the plant seems to reside. Decoctions of the leaves, inspissated to the consistence of an extract, retain a considerable share of their pungency and warmth along with their bitterness, and have some degree of smell, not resembling that of the plant itself. On inspissation of the spirituous tincture, there remains an extract, consisting of two distinct substances, of which one is yellow, unctuous or oily, bitterish, and very pungent; the other black, resinous, tenacious, less pungent, and subaltringent. Lewis' Mat. Med.

Savin is a powerful and active medicine, and has been long reputed the most efficacious in the Materia Medica, for producing a determination to the uterus, and thereby proving emmenagogue: it heats and stimulates the whole system very considerably, and is said to promote the fluid secretions. Its force in overcoming interior obstructions is so great, that it is said to have been employed, and too successfully, for purposes the most infamous and unnatural. It has, however, sometimes failed as an emmenagogue, which has, in some measure, been ascribed to the smallness of the dose given by physicians. Dr. Hume (see Clinical Exper.) seems to have had very great success with this medicine; for in five cases of amenorrhœa, which occurred at the Royal Infirmary at Edinburgh, four were cured by the sabina, administered in powder from a scruple to a dram

twice a day. He says it is well suited to the debile, but improper in plethoric habits; and he therefore orders repeated bleedings before its exhibition. Externally favin is recommended as an escharotic to foul ulcers, syphilitic warts, &c. Woodv. Med. Bot.

JUNISEN, in *Geography*, a town of Sweden, in the lapmark of Kemi; 64 miles N.N.E. of Kemi.

JUNIVILLE, a town of France, in the department of the Ardennes, and chief place of a canton, in the district of Rethel. The place contains 984, and the canton 5775 inhabitants, on a territory of 215 kilometres, in 13 communes.

JUNIUS, FRANCIS, in *Biography*, a learned French Protestant divine, descended from a noble family, was born at Bourges in the year 1545. At the age of thirteen, he had made an extraordinary proficiency in learning; and being intended for public life, he began the study of the civil law, and after prosecuting it for some years, he was sent to Lyons, to join the train of the ambassador from the king of France to Constantinople. He unfortunately arrived too late, and accordingly remained in that city to attend the public lectures of the college. Here, by his avidity in pursuing knowledge, he recommended himself to the principal, which was of great service to him in his studies. In this city he became acquainted with a person deeply tinctured with sceptical notions, and became himself an atheist. On his return to Bourges, his father engaged him in a course of reading, particularly of the New Testament, which insensibly reclaimed him from those principles which he had imbibed at Lyons; and from this period he attached himself to studies connected with sacred literature and piety. In 1565 he was appointed minister of the Walloon church at Antwerp, where his labours were eminently useful in spreading the reformed religion, on account of which his father had been murdered a short time before by the bigotted Catholics. Junius soon became obnoxious to the Inquisition, which had been lately introduced into the Low Countries; and many attempts were made by the emissaries of that tribunal to get possession of his person, which timely information enabled him to elude. In 1568 he was made chaplain to the prince of Orange, whom he accompanied during the unfortunate expedition to the Netherlands; and upon his return, he resumed his ministerial functions at Schoon, to which he had been before appointed by the elector palatine Frederic III. He was, after this, noticed by Henry IV. of France, and employed upon some public missions; which being accomplished, he accepted the divinity professorship at Leyden, the duties of which he performed with ability and great reputation for the space of ten years. He died of the plague in 1602, in the 57th year of his age. He was author of numerous works, theological, controversial, and philological, of which the following may be mentioned: "Commentaries," on the first three chapters of Genesis, the prophecies of Ezekiel, Daniel, and Jonah; "Sacred Parallels," and "Notes," upon the book of Revelation; "A Translation out of Hebrew into Latin of the whole Old Testament;" "Hebrew Lexicon;" "Grammar of the Hebrew Tongue;" "Notes on Cicero's Epistles to Atticus."

JUNIUS, FRANCIS, son of the former, was born at Heidelberg in 1589, and was educated at Leyden. He was first intended for the military profession, but circumstances induced him to change his purpose, and he devoted himself entirely to letters. As a literary man, his first occupation was in collecting and publishing some of his father's works. In 1620 he came to England, and resided in the family of Thomas earl of Arundel, as librarian, during the space of

thirty years. Being, it is said, void of all ambition, and indifferent to the usual objects of worldly pursuit, he made study the whole business of his life. His frequent visits to the Bodleian and other libraries led him to obtain an intimate knowledge of books written in the Anglo-Saxon dialect. Convinced that in this he could discover the etymologies of all the tongues of northern Europe, he applied to it, and to the other dialects connected with it, with the greatest assiduity. His final conclusion was, that the Gothic was the mother of all the languages of the Teutonic stem. In hopes of hearing the ancient Saxon spoken in its ancient purity, he went and resided in Friesland for two years. On his return through Holland, he met with the MS. of the four evangelists in silver Gothic letters, known by the name of the silver MS. This he set about explaining, and published it with a glossary, subjoining a version of the same in the Anglo-Saxon, with notes by Dr. Marshall. He returned to England in 1674, and died at Windsor in 1677, at the age of eighty-eight. He bequeathed all his MSS. and collections to the public library at Oxford. His works are "De Pictura Veterum;" "Observationes in Willeromi Franciani Paraphras in Cantici Canticum." But his great labour was a "Glossarium Gothicum," in five languages, comprised in nine volumes. An "Etymologicum Anglicanum" was published from his papers, by the Rev. Edward Lye, in 1743. Bayle. Wood Ath. Ox.

JUNIUS, in *Geography*, a military township of America, in Onondaga county, New York, at the N. end of Cayuga lake.

JUNIUS *Creek*, a northern branch of the Little Kanaway, which interlocks with the western waters of Monongahela river. See KANAWAY.

JUNK, a river of Guinea, which runs into the Atlantic, N. lat. 6° 5'. W. long. 10° 5'.

JUNK, in *Sea Language*, a name given to any remnants or pieces of old cable, which is usually cut into small portions, for the purpose of making points, matts, caskets, fennit, &c.

JUNKS, large flat-bottomed vessels, from 100 to 500 tons burden, used by the Chinese. They have three masts, and a short bowsprit placed on the starboard bow. The masts are supported by two or three shrouds, which at times are all carried on the windward side. On the fore and main mast is hoisted a sort of lug-sail, made of cane or bamboo. These sails are confined by iron travellers, that encircle the mast, and fixed to bamboos at several divisions on the sail. The sail is kept to the wind by two ropes, fastened to wood stirrups, fixed to the foot of the sail, and lead to the mast-head. The lee part of the sail is hauled aft, by a rope that branches into short legs, that are made fast to each fold of the sail. On the mizen-mast is a gaff-sail, made of coarse cotton; a top-sail made of the same is carried on the main-mast; also a jib and sprit-sail, that are set on the bowsprit. Similar to these junks are the Japanese barks, which are 80 or 90 feet long on one deck, but have only one mast, that carries a square sail, and forward one or two jibs made of cotton. They only use sails when the wind is large.

JUNKER, CHRISTIAN, in *Biography*, was born at Dresden in 1688. He studied at Leipzig, was made first rector and librarian at Eisenach, and historiographer to the prince of Saxony. In 1711 he was elected a member of the Royal Academy of Sciences at Berlin, and in 1713, director of the gymnasium at Altenburg. He died in the following year through grief from the loss of his wife, whose death preceded his own but five days. Of his literary talents he gave sufficient proof by the many works which he published, and particularly by his "Geography of the Middle

"Middle Ages," in quarto. This work, which was published at Jena in 1712, is divided into two parts, and the whole concluded with a very useful index of all the countries, towns, villages, forests, rivers, and mountains known in the middle ages. His other principal works are, "Vita D. Mart. Lutheri et successum Evangelicæ Reformationis," &c.; "Vita Jobi Ludolphi, accedunt Epist. aliquot clariss. virorum, nec non Specimen Linguae Hottentotticæ;" "Principles of the Ecclesiastical History of the Old and New Testament;" and "Lineæ primæ Eruditionis universæ Historiæ Philosophicæ." Gen. Biog.

JUNKOWADA, in *Geography*, a town of Africa, in the kingdom of Yani; 22 miles W. of Pisania.

JUNKSEILON, or JUNK CEYLON, an island in the East Indian sea, on the E. side of the bay of Bengal, belonging to Siam, and governed by a viceroy from that court. It derives its name, according to captain Forrest, from a corruption of "Oojong Sylan," signifying, in the Malay language, point or promontory of Sylan, the S. point projecting a little way into the sea. It stretches nearly N. and S. about 50 or 60 miles long, and is about 15 miles broad; its centre is situated in 8° N. lat. separated from the continent of Malacca by an isthmus of sand, about a mile long and half a mile broad; which isthmus is covered only at high water, and shuts up in the N. part an excellent harbour, called "Popra," with good anchorage round it, generally on a muddy bottom. The hills of this island are of moderate height; and instead of rivers, it has creeks, running into the sea, through flat marshes of mangrove trees from pleasant brooks in the interior parts. The vessels used by the inhabitants consist of a few prows, about the size of Indiamen's long boats, and small canoes, in which they sail up the creeks to the cultivated plains in the middle of the island, abounding with rice fields. Besides Popra, there is another capacious harbour on the S. W. part of the island. The place where ships generally anchor is in a good road, well sheltered behind a small island, joined at low water to the main land. In this island are 17 towns or villages, and the number of inhabitants is estimated at about 12,000. They have many elephants procured from Mergui, but no horses; they have bullocks and buffaloes for labour; wild hogs and deer; a few tame goats; no sheep; domestic dogs and cats. They have some of the common poultry. The climate is agreeable, without extreme heat; the rain comes on gently in July, and continues, but not without frequent intermissions, till November, when fine weather succeeds, with very cool N.E. winds at night, favourable to the cultivation of vegetables. The opium, formerly sold on this island in great abundance, was brought in English ships from Bengal, and purchased by those who used Malay and Buggefs prows; they sold it by retail to the natives for tin, and exchanged it with the Bengal vessels for opium, which they carried chiefly to Celebes and other Malay islands. The mixed cargo of the Malays was generally a chequered cloth, called Buggefs cambays, made on the island of Celebes, painted cloths and painted handkerchiefs of Java, generally made from Hindoostan long cloth, Java gongs, brass pots, and other utensils of brass made in that island; China and Java tobacco; various porcelain; blue and white unbleached cloth called "kangan," and white and blue called "compow," brought from China by the junks that resort to Siam, Macassar, Sooloo, Batavia, and other places. But the course of trade is much altered of late: opium being forbidden to the natives, the importation of it is prohibited, and a heavy duty is laid on the exportation of tin by orders from Siam; so that the trade has much declined. Hindoostan piece goods, and some European articles, such as iron,

steel, lead, cutlery, and broad cloth, being almost the only imports. The trade of this island is considerable in ivory and tin. The exportation of tin is annually estimated at 500 tons. N. lat. 8°. E. long 98° 20'.

The Birmans, wishing to obtain the entire dominion of the western coast, as far as the territories of the Malay prince of Queedah, made an attempt, in 1785, to get possession of this island. By so doing, they would have been able to monopolize the commerce of the peninsula, and prevent the Siamese from communication with India by any other channel except the gulf of Siam. Besides, the island was desirable on account of its mild climate and luxuriant soil. Having fitted out a powerful armament of 11 ships and 8000 men, they attacked the fort, which is situated on the E. side of the island, and succeeded, notwithstanding a spirited resistance on the part of the Siamese governor, who afterwards withdrew from the fort into the interior of the island. The triumph of the Birmans was of short duration: the Siamese governor rallied his forces, and drove the Birmans to their shipping with great loss. Apprehensive of greater disasters they returned to Mergui, whence the fleet sailed for Rangoon, and the troops marched to Martaban. In the year 1786, the Birmans renewed their attack, and blocked up the harbour of Junkseylon; but in the event they were completely routed by a powerful army of the king of Siam. Symes's Embassy to Ava, vol. i. See SIAM.

JUNO, in the *Heathen Mythology*, a goddess; the daughter of Saturn and Rhea, the sister and wife of Jupiter: she is otherwise called Lucina. According to Hesiod, she was the mother of Hebe, Venus, Lucina, and Vulcan.

Juno, as well as Jupiter, had a great variety of characters among the ancients, but the favourite one of them all, among the Romans, was that of the Juno Matrona, dressed like the Roman matrons in a long robe which covered her from head to foot. The figures of the Roman empresses were often formed under this character of Juno. Such is the statue of Sabina, at the Villa Mattei in Rome. This Juno was called indifferently, Juno Matrona and Juno Romana. The Juno Regina, and Juno Moneta, are always represented on the ancient gems and medals, in a very fine and magnificent dress, with the instruments of coinage, and under the latter appellation she had a temple at Rome. We may observe, that Virgil, *Æn.* i. v. 17. and *Æn.* ii. v. 614, speaks of Juno, not according to the appearance she used to make among the Romans, but according to the representations of her in other countries. In one place, where he describes her arms and military chariot, he speaks of the Carthaginian Juno; and in the other he has given her an angry and warlike figure, which belongs to the Juno Argiva, or some particular Juno of the Greeks. However, the Juno Sospita, among the Romans, appears on several medals in a war chariot, and with a spear in her hand. She was called Sospita, because she watched over the salubrity of the air, the temperature of which is the cause of diseases. Under this name she had three temples, one at Lanuvium, and two at Rome: and Cicero informs us, that the consuls, before they entered upon their office, were obliged to offer a sacrifice to her. Another name of Juno was the "Queen," or "Regina," under which appellation she had a statue at Veii, that was transported to the Aventine mount, under the dictatorship of Camillus, where it was consecrated by the ladies of the city. This statue was held in such reverence, that none but her priest could touch it. There was also a mild Juno, as well as a mild Jupiter, among the Romans: under which character, her face appeared more gentle and good-humoured than usual: but the most obvious and striking character of

Juno, which we derive from the writings of Homer and Virgil, is that of an imperious and haughty wife. These poets oftener represent her scolding at Jupiter, than caressing him. Nevertheless, she was anciently considered as the great patroness of marriage and a wedded life. Under this character she had the name of *Juga* and *Pronuba*, (Virgil, *Æn.* 4.) and had an altar in the street called *Jugara*. When she presided over women in childbed, and was confounded with Diana, she obtained the name of *Lucina*, and was represented as a matron, holding a cup in her right hand, and a spear in her left, with this inscription, "Junoni Lucinæ." Sometimes she was represented sitting on a chair, holding in her left hand a child in swaddling clothes, and in the right a flower resembling a lily; and also a whip and a sceptre, the whip signifying a happy delivery. Juno, under the character of presiding over the air, is represented in a light car, drawn by peacocks, and attended by the *Auræ*, or nymphs of the air.

Of all the divinities of the Pagan world, there was not one whose worship was more solemn and more general than that of Juno. It was not confined to Europe alone, but found its way into Asia, especially into Syria; and also into Egypt, and other parts of Africa. Greece and Italy abounded with temples, chapels, or altars dedicated to this goddess, and in some places of distinction she had several of these. Among the more celebrated towns, there were three that paid a more particular worship to Juno than others, *viz.* Argos, Samos, and Carthage. The priestesses of Juno of Argos were highly respected in Greece; and their priesthood served to distinguish the principal eras of the Grecian history. Among the birds, the hawk was appropriated to her, and above all the peacock, which last was frequently an appendage to her statues. According to *Ælian* (*De Animal.*), the Egyptians consecrated to her the vulture. Dittany and the poppy were the plants which the Greeks offered to her, when they took her for Juno *Lucina*. Among the animals, the ewe-lamb was peculiarly consecrated to her, and was the most common victim offered to her in sacrifice. It was usual, however, to offer to her a fow on the first day of each month. We may infer the high veneration which was paid to Juno, especially by the women, from this circumstance, that their guardian deities were called "Junones," as those of the men were denominated "Genii." Apuleius sums up the honours that were paid to Juno in a comprehensive manner, by informing us that she was worshipped as the "Queen of the Goddesses." See JUPITER, *infra*.

JUNO the Assyrian was called *Astarte*, which see.

JUNO, in *Astronomy*, the name given to one of the new planets by M. Harding the astronomer, who discovered it at Lilienthal, in Germany, the 1st September 1804. Two of these singular bodies, Ceres and Pallas, had before been discovered by Piazzi and others, and the great difficulty with which they are formed after they have been enveloped in the sun's rays, suggested the task to Mr. Harding, of constructing a species of zodiac, to enable astronomers to find these two small planets. In this zodiac he placed not only all the stars in the catalogues, but also all the small stars which he himself could observe and place in the probable tract of the planets. It was in executing this laborious undertaking, that he perceived a small star which he thought had not been in the same place a short time before. Three days afterwards it had evidently changed its place, and advanced towards the east two degrees. A series of observations soon convinced him that he had discovered a third planet of the same class as Ceres and Pallas.

Its orbit has been calculated by Mr. Gauss and Mr. Burckhardt, as follows:

Seeberg, 1st Jan. 1805.

	Mr. Gauss.	Mr. Burckhardt.
Longitude	1° 12' 32" 36"	1° 12' 17" 31"
Aphelion	7 23 11 39	7 22 49 0
Node	5 21 4 16	5 21 6 0
Inclination	13 3 38	13 5 0
Diurnal motion	815".9595	
Annual motion	2 22 43 45.2	
Excentricity	0 254236	0 25096
Semi-axis Maj.	2 66445	2 657

The mean diameter of this planet, as seen from the earth, is, according to Schroeter, 3".057, but he differs in his opinion on this subject from Dr. Herschel, who estimates it much smaller, and astronomers are at present unable to decide to which theory they should incline.

Under the article PLANETS we shall again resume the subject of these newly discovered bodies, and attempt to shew the strong arguments that may be urged to prove that they are all fragments of a large planet which once circulated between Mars and Jupiter.

JUNOH, in *Geography*, a town of Hindoostan, in Bahar; 35 miles N.E. of Nagpour.

JUNONES. See GENIUS.

JUNONIA, the name given at Rome to a festival instituted by the Greeks in honour of Juno, and by them called *Heræa*; which see.

JUNQUERA, LA, in *Geography*, a small town of Spain, in the province of Catalonia, situated at the entrance of a plain, which, as Strabo says, was fertile in flax and spart, or sea-rush, whence it acquired the name of "Campus Juncarius," and the town that of "Juncaria." This town was established by a colony of Massilians, and was formerly considerable; but is now much reduced. It has a parish church, but little trade. The environs abound with cork trees; 30 miles N. of Gerona.

JUNTA, called also *Junto*, and *Junto*, a council, or company, of several persons, meeting for the dispatch of any business.

The term is particularly used in the Spanish and Portuguese affairs. On the death of Charles II. king of Spain, the kingdom was governed, during the absence of Philip V. by a junta.

In Portugal they have three considerable juntas: the junta of commerce, that of the three estates, and that of tobacco. The first was established by king John IV.; this is a council of marine. The same king also assembled the states of his kingdom, to create the tribunal of the junta of the three estates. King Peter II. created the junta of tobacco in 1675: it consists of a president and six counsellors.

IVOIRE, in *Geography*, a town of France, in the department of the Leman; 13 miles N.N.E. of Geneva.

IVORY, (*Ebur*), the tusks or large conical teeth in the upper jaw of the elephant. This name is also sometimes improperly given to the teeth of the sea-unicorn (*Monodon monoceros*), the morse (*Trichechus rosinarus*), and those of the Hippopotamus (see these articles).

The elephants' tusks from Africa are in general preferred by the dealers in this article; they generally run considerably larger, but it is a common opinion, that the ivory from Ceylon is less liable to turn yellow when exposed to the action of the atmosphere, whence it is sold at a higher price than the other. By far the greatest part of this merchandize is brought from Africa; and a part of Guinea, which has furnished the greatest quantity of it, has obtained the name of the Ivory Coast: the tract of coast from Cape Palmas, to Apollonia or Trespunta, is more particularly

Early known by this appellation. But the principal market for some time past appears to have been at the east coast of Africa, where the ivory is supposed to be found of superior quality; indeed the English merchants at Surat pay a greater price for the tusks furnished by this part of the coast than for such as are brought from any other part of Africa.

The best tusks are those that are least curved, without spots, and most solid towards the base. Some writers on this subject pretend that such elephants as inhabit swampy places, generally produce blue, spongy, and knotty tusks, in every respect inferior to those of elephants living in hilly countries or on dry plains. The Ethiopian elephants' tusks, according to Paul Lucas, are furnished with larger cavities, and are therefore less esteemed.

In commerce, unwrought ivory passes under the appellation of *marhil*, or *morhil*, a word which Frisch derives from the Spanish, but is probably of Moorish or Indian origin. Tusks under a certain weight (some say 14, others 20 pounds) are called *Crevelles* by the African merchants; a word which appears to be the same with *Escarballe*, or *Escarbeille* of the French, and *Scaravellios* of the Spaniards and Portuguese.

Elephants' teeth constitute a very important article of commerce. Labat computed the quantity of ivory annually imported into France at his time, by the Senegal company, to be 500 quintals, or 50,000 pounds. In 1784 the number of tusks imported into Nantes was 744, besides 360 pounds weight; and into Havre de Grace, in the same year, 435 tusks and 1805 pounds, and into Bourdeaux 5999 pounds. In the following year 3007 pounds and 471 tusks were imported into Nantes; in 1787, 16,184 pounds and 395 teeth; and into Havre de Grace 3784 pounds.

In an account which the house of commons ordered to be given in, of the quantities of the principal articles in the nature of raw materials, imported and used in the manufactures of Great Britain for twelve years preceding the year 1799, we find the following respecting the importation of elephants' teeth; *viz.*

1788	1,387 cwt.
1789	2,145
1790	1,476
1791	3,735
1792	1,484
1793	1,412
1794	2,203
1795	1,247
1796	1,167
1797	1,969
1798	889

and in an account, likewise delivered to the house of commons, of the quantity of the same articles, on an annual medium of four periods of five years, each commencing the 5th of January 1772, the following related to the article under consideration; *viz.* Five years preceding

5th January 1776	690 cwt.
1787	1,339
1792	2,050
1799	1,291

The component parts of ivory being the same as those of bones (*viz.* phosphate of lime combined with a gelatinous substance), and differing only with regard to texture, hardness, and whiteness, the preparations it undergoes in the arts are equally applicable to the bones of animals. The whiteness which ivory acquires depends chiefly on the degree

of dryness it has acquired. When yellow, its gelatinous matter is altered by the air, and appears to be combined with the oxygen of the atmosphere. Oxygenated muriatic acid will restore it to its original whiteness. Those employed in working ivory, distinguish the *white* and the *green*. The former is known by the whitish or lemon coloured rind of the tusks, the other by the brown and blackish. The green ivory (so called from a greenish or faint olive colour pervading its substance) is preferred, it being of a closer texture, and known soon to exchange its green hue for the most beautiful white, which is less liable to turn yellow. This green ivory is, however, more brittle than the other.

Heat cannot be made use of for making ivory pliant, though it is rendered softer by being exposed to that agent. It is divided by the saw; sometimes (for delicate work) under water, in order to prevent its being heated or rent in the operation. It is polished with pumice and tripoli. Ivory has been said to become soft by being placed in mustard; but that end is attained with greater certainty by steeping it in some diluted mineral acid. Both ivory and common bones become also soft by being immersed in an alkaline lye made of soda and quick lime.

By burning this substance in closed vessels, and afterwards levigating it with water on a porphyry slab, we procure what is called *black ivory*, much used for painting and other purposes that require a very intense velvet-like black colour.

The following observations, relative to the nature of the tusks of elephants, are extracted from Cuvier's excellent memoir "On living and fossil Elephants," in the *Annales du Museum*, and translated in the *Philosophical Magazine*, vols. xxvii. xxviii. and xxix. to which, especially as our article ELEPHANT was written previous to the publication of that elaborate memoir, we refer our readers for a more complete natural history of that remarkable animal.

Cuvier, in examining the varieties of tusks, and the differences remarked in this respect among elephants, observes, that their texture exhibits no important difference. It always presents, upon its transverse section, those streaks which proceed like an arc of a circle from the centre to the circumference, and form, in growing, curvilinear lozenges which occupy the whole disk, and which are more or less broad, and more or less perceptible to the eye. This character, common to all elephant ivory, and depending immediately on the pores of their pulpy nucleus, is not to be found in the tusks of any other animal. It is to be seen in all fossil tusks, and it refutes the opinion of Leibnitz, adopted by some other writers, and even by Linnæus, that the mammoth horns might have belonged to the *Tricheus rosmarus*. The tusks of these animals, however, seem wholly composed of small round accumulated grains.

The size of tusks varies according to the species, sexes, and varieties; and as they are growing all their lives, age, more than any thing else, influences their dimensions. The African elephant, as far as we are able to ascertain, has very large tusks in both sexes. The African female, 17 years old, the skeleton of which is in the museum of Paris, has larger tusks than any male or female Indian elephant of the same size that we are acquainted with. It is from Africa we receive the most ivory, and the greater number of tusks; and they are also harder and whiter than any others. But our limited knowledge is confined to the elephants of the western coasts, and to those of the south of Africa. We are ignorant if those of the eastern shores resemble them in every thing, and if there be any varieties in the interior. We know from Pennant, however, that the coast of Môsambique

IVORY.

Mozambique furnishes tusks ten feet long, being the largest ever known. In the Indian species there are more varieties of tusks, which Mr. Corfe has developed with more care than any other writer (see Phil. Transf. 1799, and art. ELEPHAS;) but all these varieties have nothing constant, and are mixed indiscriminately with each other. In Bengal, the tusks weigh little more than 72 pounds, and they do not exceed 50 in the province of Tipperah, which produces the best elephants. There are tusks in London, however, probably

from Pegu, which weigh 150 pounds. It is, in fact, from Pegu and Cochin-China that the largest elephants and tusks of the Indian species come. The coast of Malabar furnishes no tusks, according to Pennant, more than four feet long.

Cuvier has drawn up the following table of the length, diameter, and weight of the largest tusks taken from other authors, or actually inspected by himself; the tusks from Africa are not distinguished here from those of India.

Authors who have quoted the Facts.	Their Authorities and Details upon the Origin of the Tusks.	Length following the Curvature.	Diameter at the thick End.	Weight.
				<i>lb. oz.</i>
	{ Tusk from Sumatra, according to Louis Vartoman, } quoted by Jonston - - - - - }	—	—	168 0
	Tusk mentioned by J. C. Scaliger, "de Reb. Ind." - - - - - }	—	—	162 0
	Tusk from the Cab. of Septal, quoted by Herzog - - - - - }	—	—	160 0
	Tusk mentioned by Vielhaucrs, "Traité des Dro- } gues" - - - - - }	—	—	200 0
	Tusk, by Louis Barth, "de Reb. Indic." - - - - - }	—	—	325 0
Hartenfels Elephanto- graphia, P. 47, 48.	{ Tusk at Basle, brought from India, quoted by Munster } in his "Cosmographie" - - - - - }	9'	—	about 100 0
	Idem - - - - -	—	—	114 0
	Another tusk mentioned by J. C. Scaliger - - - - -	more than 5'	—	—
	Idem by Al. Cadamosto - - - - -	8'	—	—
	The largest tusk, according to Gyllius - - - - -	10'	—	—
	A tusk in the possession of a merchant of Venice - - - - -	14'	—	—
	{ The tusks taken from Firmus, by Aurelian, according } to Flavius Vopiscus - - - - - }	10' Rom.	—	—
	Common tusks from Guinea - - - - -	—	—	100 to 120 0
Camper Defer. Anat. d'un Eleph.	{ A tusk belonging to Mr. Wolfers, merchant in Amster- } dam - - - - - }	7' 4" of France	9 1/2"	208 0
	{ Tusk belonging to Mr. Ryfsnyder, merchant in Rot- } terdam, according to Klockner - - - - - }	—	—	250 0
	Tusk sold at Amsterdam; same author - - - - -	—	—	350 0
	Tusk in Camper's cabinet - - - - -	6"	7"	105 0
Faujas Géo- logie, 243. Mém.d'Hist. Nat.del'Ital. 11.	{ The largest tusk in the Museum of Natural History at } Paris - - - - - }	6' 6"	5" 4"	72 8
	{ Tusk in the Florence cabinet - - - - - }	—	7" 6"	—
Pennant.	{ The large tusks from Mozambique - - - - - }	{ 10' Eng. or } { 9' 2" of Fran. }	—	—
	Several tusks measured by Eden - - - - -	9' Eng.	—	from 90 to 125 0
Buffon Hist. Nat. t. xi. 4to.	Lopés - - - - -	—	—	200 0
	Drack - - - - -	—	—	200 0
	{ Tusks from Lowango, according to the Voyage of the } Indian Company - - - - - }	—	—	126 0
	{ Tusks from the Cape, according to Kolben - - - - - }	—	—	from 60 to 120 0

As the tusks, M. Cuvier adds, grow during the life of the animal, and the body does not, the size of an elephant cannot be concluded from its tusks, even by establishing the proportion between individuals of one same variety, and the same sex: as, on the other hand, the tusks rot or break at their points, according to the greater or less use the animal makes of them, and they are sharpened, more or less abruptly, into a point, we cannot conclude their length from the diameter at their base. Finally, their weight cannot be concluded from their dimensions (Messer Schmidt in the Phil. Transf.), because their cavity at the base may be more or less filled. The degree of curvature of the tusks of elephants

varies almost as much as their size. In various cabinets there are several tusks to be seen with curvatures more or less strange, and in particular some are spiral. Camper saw several of them in the British Museum, and Grew represents one which is turned round several times; and Cuvier knows, from M. Fabroni, that there is one of that description in the Florence cabinet also. They are frequently seen in the form of an Italic S, &c.

A green dye may be given to ivory, by steeping it in aquafortis, tinged with copper or verdigris, or in two parts of verdigris and one of sal ammoniac, ground well together, with strong white-wine vinegar poured on them: and by converting

converting the aqua-fortis into aqua regia, by dissolving a fourth part of its weight of sal ammoniac in it, ivory may be stained of a fine purple colour.

Ivory, bone, horn, and other solid parts of animals, may be stained black, in the same manner as wood. These substances may be stained yellow, by boiling them first in a solution of one pound of alum, in two quarts of water; and then, having prepared a tincture of the French berries, by boiling half a pound of the berries, pounded, in a gallon of water, putting them into this tincture, after it has boiled about an hour, and letting them remain there half an hour. Turmeric root may be used instead of the berries; but in this case the ivory, &c. must be dipped in alum water after it is taken out of the tincture. Ivory, &c. may be stained blue, by first staining it green, and then dipping it in a solution of pearl ashes made strong, and boiling hot: or it may be otherwise boiled in the tincture of indigo, prepared by the dyers; and afterwards in a solution of tartar, made by dissolving three ounces of white tartar, or cream of tartar, in a quart of water. For other processes and colours, see *DYEING of Bone, &c. Colouring and Staining of Bone, and TORTOISE Shell.*

Ivory may be prepared as a ground for miniature painting, by cleansing the ivory leaves or tables, and rubbing them over with the juice of garlic. This is said to be more essential for taking off the greasiness, which prevents the colours from fixing on the ground, than soap or gall. Ivory has the same medical virtues with hartshorn; its shavings too, like those of hartshorn, boil into a jelly with water, and have the same restorative quality. See *HARTSHORN*.

IVORY Black. See *IVORY BLACK*.

IVORY, Fossil, in Natural History. It is not uncommon in the most modern alluvial soils, like the vallies in the basin of Paris, mentioned by Cuvier and Brogniart, and the soil in which the docks adjoining the Thames were excavated, to find the bones, teeth, and tusks of elephants; and this fossil ivory is not, in some instances, much altered, though in general it has lost its consistence in a great measure, and readily scales off in concentric rings, and in others is impregnated with metallic substances, so as to imitate, if not form the Turquoise stones, the Callais of Pliny, &c. as Dr. Woodward has shewn in his *Letters on the Method of Fossils*, p. 15. It may, however, be doubted, we believe, whether fossil ivory has ever been found imbedded in the strata, or the parts of any dry-land animals, numerous as their remains are in the last alluvial covering of some districts. The abundance of elephants' teeth found buried in different parts of the world, and many of those parts such as no elephant is ever known to have lived in, have given amazement to naturalists.

The long tusks, which are what we call ivory, are the only teeth the vulgar are acquainted in this creature; yet even these, in their fossil state, have often been mistaken for horns, or other animal parts. The grinders of this animal are so enormously large, and of so singular a shape, that it requires some knowledge in natural history to discover them at sight, and many have mistaken them, when imperfect, for parts of a petrified shell-fish of the nautilus kind, their root being hollowed all along, and armed with an indented ridge on each side, in the manner of the back parts of some shells of that and of the Cornu ammonis kind.

We are not to wonder that the teeth of elephants are found more frequently than any other bones of the animal, since their use in the creature required that they should be harder than any other bone, and that hardness has preserved them in places where the other bones have perished. The

different state in which these teeth are found, is wholly owing to the different juices abounding in the earth in the place where they were deposited, some of those juices being of power to preserve, others to destroy them; some eating them insensibly away, some as it were calcining them by slow degrees, and others rendering them greatly more hard and durable than before. *Mem. Acad. Par.* 1727.

Count Marfigli, and some other writers, have thought it an easy solution of the question of the teeth and bones of elephants being found in countries where elephants are not naturally found, that we owe them to the Romans; who, bringing them over for their use in war, buried them wherever they happened to die. But Sir Hans Sloane expresses himself very justly against this opinion: he observes, that of the remains of elephants found in Europe, nothing is so common as the ivory tusks. Now, as he well observes, the Romans held ivory in the highest esteem, and it sold among them at a great price; therefore, had they been the buriers of the elephants, they would certainly have taken away the ivory tusks first. It is certain, therefore, that accident, and not design, hath buried these bones, and that accident can have been no other than some prodigious inundation. Woodward is desirous of making the universal deluge to have done all this, but that seems not necessary to be supposed in every case. Sir Hans Sloane gives an enumeration of the most curious of these pieces of fossil ivory, which his own cabinet contained, and of some others of the most remarkable, mentioned by authors; from which we may form a very distinct idea, both of the nature of the bodies themselves, and of the places where they are usually met with. See *Philos. Transf. N° 403. p. 458.*

The power of subterranean calcinations to render things of this kind brittle, is remarked by the same author from Moreton's History of Northamptonshire, in the instance of a fossil tusk of an elephant, which was in the whole at least six feet long, and had preserved its natural whiteness, though rendered so brittle as to fall into several pieces in the digging. This was dug up near Little Bowden, in Northamptonshire; and the strata of the place where it lay were as follows: 1. Vegetable mould, 14 inches. 2. Loam, a foot and a half. 3. Large pebbles, with a small mixture of earth among them, two feet and a half. 4. Blue clay; in the upper part of this last stratum the tooth was found.

Sir Hans mentions another elephant's tusk very entire and found, found in Siberia. The like are common in Siberia and many parts of Russia, and are so little injured, that they are used as ivory, and are supposed to be the teeth of a vast animal called the *mammoth*, which they think lives under ground. *Phil. Transf. N° 468.* See farther on this subject, *BONES, Fossil, ELEPHANTS' Bones, and TEETH, Fossil.*

IVORY Coast, in Geography, a name given to a country of Africa, situated on the coast of the Atlantic, between Cape Apollonia to the E. and Cape Palmas to the W. The principal towns and villages are Groua, or Grua, Great Tabo, Little Tabo, Grand Drewin, Batrou, Laho, Apollonia, and Valo. These lie at the mouths of rivers, whence they derive their names. The interior of the country is little known, as the natives do not allow the Europeans to establish settlements, or even to trade among them, except very cautiously, by means of the coast negroes. The chief commodities are gold, ivory, and slaves. The inhabitants are reckoned savage, and in a high degree jealous and suspicious; insomuch that in their traffick with the Europeans, they are artful and imposing, and so easily incensed and alarmed, that they will precipitate themselves into the sea from the European ships, and swim to their canoes.

The whole coast, if we except a few capes, from Cape Palmas to Cape Apollonia, is so low and straight, that it furnishes no distinct land-marks besides the heights and mountains round Drewin. The landing is every where dangerous, on account of the swelling waves and high surfs; and the negroes, who are acquainted with this sea, are the only people that can combat with the fury of its winds, tides, and waves, in their little canoes. From Cape Palmas to Cape Apollonia, these canoes are employed in loading and unloading our ships, that dread coming near the shore. Every country within the limits of the Ivory Coast is fruitful in rice, peas, beans, gooseberries, citrons, oranges, and cocoa-nuts, besides sugar-canes. Upon the whole, the Ivory Coast is reckoned one of the finest divisions of Guinea: the mountains and vallies, filled with villages, which are surrounded with lofty palms and cocoa-trees, present a delightful prospect. The soil of the high land is a reddish earth, which, with the perpetual verdure of the trees, forms an agreeable mixture of colours. Cotton and indigo are the spontaneous growth of the provinces of Great Drewin and St. Andrew, which are the richest of the whole. Palm wine and oil are plentiful; together with a species of fruit, growing on a sort of palm-tree, which the natives call *tombo*, or *bourbon*. This the negroes eat with great pleasure, drinking at the same time a wine, drawn from the same tree, mixed with water. All sorts of tame animals, sheep, cows, goats, and hogs, are so numerous, that they are sold almost for nothing. The coast affords great variety and abundance of fish. As to the people, they are rather above the common stature, clean-limbed and well proportioned; but their features on the first glance are hideous; yet when the first impression is removed, Villault and Der Marchais concur in representing them as the most rational, civilized, and polished people in all Guinea. This account, however, is restricted to the natives of the Quaqua coast, that is, from the river Drewin to cape Apollonia; for as to the others, all authors describe them as the most barbarous, cruel, and savage of all nations. Drunkenness is a crime of so odious a nature among the most civilized, that the laws have prohibited it under the severest penalties, and on pain of death. Their diet is coarse and indelicate. Their teeth are sharp, as they are in the constant habit of pointing them, and in general they are crooked and irregular. Long nails and a quantity of hair are deemed very ornamental. They are much addicted to the chewing of betel, with the juice of which they moisten the neck and chin, under a notion, that it gives a fine varnish and beautiful lustre to the skin. Round the small of the leg they wear large and heavy rings of iron, to which are appended bells, with the tingling sound of which they are most delighted; and the multitude of these, as they imagine, constitute their dignity and grandeur. The common people only wear a piece of cloth round the waist, from a regard to decency; but persons more opulent cover themselves with a sort of cloak or surplice, with long sleeves, which they wrap round the shoulders, and hang down below the knees; and by their sides they wear hangers or short swords. Some of the women, who do not part with their hair to the men, adorn it with little plates of pure gold; and they are fond of costly trinkets. Their dress is a cloth, which falls over the fore-part of their bodies, the hinder parts being left naked; and indeed there are hardly any people on the whole coast of Guinea so primitive and simple in this particular, as the natives of the Ivory Coast, and particularly of Quaqua. Their form of salutation they have in common with all negroes; that of laying hold of the fingers, making them crack, and repeating the word "quaqua" several times in a low voice. It is a constant rule among them, that the son follows the profession of the father, what-

ever it may be. In the mechanic arts they are singularly expert; a common door-lock is reckoned a great curiosity; a watch excites still higher admiration; and making paper speak, as they express it, is a perfect miracle. Their religion, like that of the people on the Gold Coast, is wholly founded in ignorance and superstition. They entertain great reverence for their princes and priests; and they are fully persuaded, that magic and sorcery are powers inseparable from majesty and priesthood. The natives of Quaqua cultivate several branches of trade with assiduity; and crowd on board any ships that approach their coast with all the produce of their country, gold, ivory, provision, and slaves. The European factors are much amused with observing canoes filled with men crowding round them, whilst every mouth utters the same sound, *quaqua, quaqua*, which seems to be a word by which they express welcome. The negroes of Quaqua, however, are timorous and jealous in their intercourse and traffic with Europeans. The usual trade carried on in this part of the coast consists of cotton cloths, ivory, gold, and slaves. The maritime negroes act as brokers to the inland negroes, sell their stuffs for them, and receive so much *per cent.* by way of commission. The Quaqua negroes manufacture a kind of plant, resembling hemp, into a strong cloth, to which they give beautiful colours, and pleasing flowers and designs that indicate them to be no bad artists in their way. They have also a considerable trade in salt with their inland neighbours, to whom they sell it at a very high price, on account of the distance and expence of carriage. All the countries behind Quaqua furnish large store of elephant's teeth, the most beautiful ivory in the world. This is constantly bought up as soon as it is brought to the coast by the English, Dutch, French, and sometimes by the Dances and Portuguese. Villault infers from the quantity of pure gold which the women wear for ornament, that the inland country has mines that furnish virgin native gold. The European commodities which the negroes accept most readily in exchange for their own, are such as are held in estimation in other parts of Guinea; with this difference, that here the bracelets and rings for the legs, either of copper or iron, must be of an intolerable weight.

Although the Ivory Coast be divided into a variety of petty states or kingdoms, yet they have scarcely any separate interests; for among themselves war seldom happens, and of consequence, the slave trade here has borne but a small proportion to that traffic on the Gold and Slave Coasts.

Authors have observed, that the *exomphalus*, hernia umbilicalis, or preternatural tumour of the abdomen at the navel from a rupture, is a disorder extremely common on the Ivory Coast; though they are unable to account for its prevalence. Other deformities are as rare as this is common. *Mod. An. Hist.* vol. xiv.

JUPARITUBACA, a river of Brazil, which runs into the Atlantic, S. lat. $11^{\circ} 10'$.

JUPITER, a river of the island of Anticosti, which runs into the river St. Lawrence, N. lat. $49^{\circ} 25'$. W. long. $63^{\circ} 42'$.

JUPITER, or **JOVE**, in the *Heathen Mythology*, the sovereign god of the heathens; the son of Saturn and Rhea; born in the island of Crete, at the same birth with Juno; he married Juno, expelled his father out of his kingdom, and divided the kingdom of the world with his brethren. Under several shapes he is said to have played many wanton pranks; so that, according to poetic fiction, he filled heaven with his natural children.

The philosophers, as we learn from Cicero's discourses on the nature of the gods, took Jupiter only for the more purified air, or the ether, and Juno, his wife, for the grosser air

JUPITER.

air that surrounds our earth. Those who regarded him as an animated god, or one of those men, who, for their illustrious actions or useful inventions, were raised to divine honours, after having considered him as the sovereign of gods and men, or as an almighty god, who, by the mere movement of one of his eye-brows, made Olympus tremble, degraded him afterwards by ascribing to him the most unworthy actions and the most enormous crimes; he is, according to them, guilty of incest and adultery, an ungrateful son, a faithless husband, choleric, passionate, and revengeful. Whence, we may naturally inquire, did the Greeks and Romans, renowned for their genius and philosophy, derive such ideas of their supreme divinity? They were the poets, it is said, who gave such a representation of their Jupiter; but they must have borrowed it from the prevalent theology of the times. However, the history of this god is perplexed by the number and variety of persons, to whom the name has been applied. We may observe, that the history of Jupiter, who was best known, is that of him, who had been king of Crete, and this history is filled up with the adventures of all the rest. The ancients are not agreed with respect to the number of those, to whom the appellation of Jupiter was applied. Diodorus Siculus reckons only two; one, who was the prince of the Atlantidæ, and the other, supposed to be his nephew, who became much more famous, and was king of Crete, the limits of whose empire extended to the extremities of Europe and Africa. Cicero admits three; two from Arcadia, one the son of Æther, and father of Proserpine and Bacchus, and the other, the son of Cælus, and father of Minerva, who is said to have invented war, and to have presided over it; and a third, the son of Saturn, born in Crete, where, says Cicero, his tomb is still to be seen. The most ancient of these, who bore the name of Jupiter, is said to have been Jupiter Ammon of the Lybians. (See AMMON.) Jupiter Serapis, worshipped also in Egypt, is very ancient. (See SERAPIS.) Jupiter Belus claims high antiquity; he is said to have had a temple at Babylon, and was, according to Herodotus, the Jupiter of the Assyrians. (See BELUS.) Jupiter of Thebes has been supposed by some to have been Ammon, and by others Osiris. (See OSIRIS.) The Scythians, the Ethiopians, and several other nations, had their respective Jupiter. Indeed, it is impossible to give a complete list of all who bore that name, since, according to Varro and Eusebius, they amounted to 300. Besides, all the gallantries that are ascribed to Jupiter of Crete, and which, according to the poets, lasted 400 years, cannot belong to one and the same person. Jupiter of Crete, having banished his father Saturn, and overthrown the Titans and Giants, determined to make his subjects happy. According to Hesiod, he was seven times married, and the last of his wives was Juno. His true name is said to have been "Jou," signifying young, to which was afterwards added the appellation of "Pater," father, whence was derived Joupater and Jupiter. Others derive Jupiter from Juvan, or Juvans Pater. The Greeks call this god Zeus. The designation of father was intended to point out his superiority over the other gods, which was also expressed by the epithets "Optimus Maximus." Jupiter, having become master of a vast empire, married his sister, named by the Latins Juno, and by the Greeks Hera; and as he found it difficult to govern dominions of so wide an extent, he distributed them into different provinces. Accordingly we learn from Diodorus Siculus, that Atlas governed the frontiers of Africa. The ancients also inform us, that Pluto was appointed governor of the western parts of the empire of the Titans, of the Gauls, and Spain; which government was afterwards transferred, upon Pluto's death, to Mercury, who, having signalized

himself, became the great divinity of the Celtæ. Jupiter reserved to himself the whole east; that is, Greece, the Îles, and that part of Asia whence his ancestors had sprung. Those of the ancients who wrote the history of Crete, extolled Jupiter for his prudence, valour, and justice, and for other civil and military virtues; and from these historians, whose works are now lost, the Greek authors are said to have taken the accounts they have given us of this prince. Oppressed with old age, after many adventures which ought to have been ascribed to other princes who bore his name, he died in Crete, where his tomb was, for a long time, seen near Gnosus, one of the principal cities of the island, with this epitaph, "Here lies Zan who was called Jupiter." He lived to 120 years, having reigned 62 years from the defeat of the Titans and the death of Saturn. Banier reckons his reign to have begun 1842 years B.C., and to have terminated at his death 1780 years B.C. After his death his dominions were divided into several petty kingdoms; of which we have no account. The poets embellished the ancient traditions, probably in part true, and in part false, with a great variety of fabulous circumstances, which best suited the age and country in which they lived, and the purposes for which they wrote; and it would be endless to give a minute detail of the various fables which their luxuriant fancy created. Perhaps, in the better and more approved mythology, Jupiter might represent the supreme god, who governed at once heaven, earth, and hell. (See Pausanias in Corinth. c. 24.) The various names by which this deified Jupiter, who was the great divinity of the Pagan world, and who was universally worshipped from Egypt to the centre of Spain, was distinguished, were derived from the places where he was worshipped, or from some circumstances that gave rise to the temples, chapels and altars that were consecrated to him; but it is needless to recount them. Many of them occur in the sequel of this article, and make separate heads in the Cyclopædia. Of all the gods of Paganism, whether they were derived from the elements of nature or from some eminent persons, who were raised to this rank, the Jupiter seems to have been pre-eminent, and of course his worship was the most solemn, and attended with the greatest variety of ceremonies. The most common victims offered to this god were the she-goat, the sheep, and the white bull, whose horns they took care to gild. In several cases they had no victim, but made him an offering of flour, salt, and incense, especially at Rome; at Athens, they sacrificed an ox; and when he represented Jupiter the avenger, the sacrifice of atonement presented to him was a she-goat. He had a temple at Rome, under that name, near the Capitol, where he was represented with arrows in his hand, to denote that he was ready to execute vengeance upon crimes. Among the trees, the oak and the olive were consecrated to him. None worshipped him more religiously, if we may believe Cicero, than the Roman ladies; "A Matronis Romanis castissima cultus" says that author. (De Nat. Deor. l. i.) Jupiter's three oracles, that of Dodona, that of Trophonius, and that which he had in Libya, were famous. See ORACLE.

As mankind are directed by an internal spirit or mind, the universe also is governed by an over-ruling intelligence; which, as the cause and preserver of all animal beings, was called *Συς*; à *Ζωο*. See GOD.

The heathens in general believed that there was but one supreme God; but when they considered this one great being as influencing the affairs of the world, they gave him as many different names; and hence proceeded their variety of nominal gods. When he thundered or lightened, they called him Jupiter; when he calmed the sea, Neptune; when he guided their councils, Minerva; and when he gave them

strength in battle, Mars. In process of time they used different representations of this Jupiter, &c. and considered them, vulgarly at least, as so many different persons. They afterwards regarded each of them in different views: *e.g.* the Jupiter that showered down blessings, was called the *Kind* Jupiter: and when punishing, the *Terrible* Jupiter. There was also one Jupiter for Europe, and another for Africa; and in Europe, there was one great Jupiter who was the particular friend of the Athenians, and another who was the special protector of the Romans: nay, there was scarcely a town or hamlet perhaps, in Italy, that had not a Jupiter of its own; and the Jupiter of Terracina or Jupiter *Anvur*, represented in medals as young and beardless, with rays round his head, more resembled Apollo than the great Jupiter at the Capitol. In this way Jupiter at length had temples and different characters almost every where: at Carthage, he was called Ammon; in Egypt, Serapis; at Athens, the great Jupiter was the Olympian Jupiter; and at Rome, the greatest Jupiter was the Capitoline Jupiter, who was the guardian and benefactor of the Romans, and whom they called the best and greatest Jupiter, "Jupiter optimus maximus." The figure of this Jupiter was represented in his chief temple on the Capitoline hill, as sitting on a curule chair, with the fulmen or thunder, or rather lightning, in one hand, and a sceptre in the other. This fulmen in the figures of the old artists was always adapted to the character under which they were to represent Jupiter. If his appearance was to be mild and calm, they gave him the eonic fulmen or bundle of flames wreathed close together, held down in his hand. When punishing, he holds up the same figure, with two transverse darts of lightning, sometimes with wings added to each side of it, to denote its swiftness: this was called by the poets, the three-forked bolt of Jove: and when he was going to do some exemplary execution, they put in his hand a handful of flames, all let loose in their utmost fury; and sometimes filled both his hands with flames. The superiority of Jupiter was principally manifested in that air of majesty which the ancient artists endeavoured to express in his countenance: particular attention was paid to the head of hair, the eye-brows, and the beard. There are several heads of the mild Jupiter on ancient seals, where his face has a mixture of dignity and ease in it, admirably described by Virgil, *Æn.* i. v. 256. The statues of the Terrible Jupiter were generally of black marble, as those of the former were of white: the one sitting with an air of tranquillity; the other standing, more or less disturbed. The face of the one is pacific and serene; of the other angry or clouded. On the heads of the one the hair is regular and composed; in the other, it is so discomposed, that it falls half-way down the forehead. The face of the Jupiter Romans resembles that of the Terrible Jupiter: he is represented on gems and medals as holding up the triple bolt in his right hand, and standing in a chariot, which seems to be whirled on impetuously by four horses. Thus he is also described by the poets. Ovid. *Deian.* Herc. v. 28. Horace, lib. i. od. 34. v. 8. Jupiter, as the intelligence, presiding over a single planet, is represented only in a chariot and pair: on all other occasions, if represented in a chariot, he is always drawn by four horses. Jupiter is well known as the chief ruler of the air, whose particular province was to direct the rains, the thunders, and the lightnings. As the dispenser of rain, he was called Jupiter Pluvius; under which character he is exhibited seated in the clouds, holding up his right hand, or extending his arms almost in a straight line each way, and pouring a stream of hail and rain from his right hand on the earth; whilst the fulmen is held down in his left. The wings that are given to him

relate to his character of presiding over the air: his hair and beard in the Antonine pillar are all spread down by the rain, which descends in a sheet from him, and falls for the refreshment of the Romans; whilst their enemies are represented as struck with the lightnings, and lying dead at their feet. Spence's *Polymetis*, p. 46. 182, and 210, &c.

JUPITER, in *Astronomy*, the largest of the planets of the solar system; his diameter being 11 times greater than that of the earth, or 89,170 English miles. Its revolution on its axis is performed in 9 hours, 55 minutes, and 37 seconds. This planet moves from west to east in a period of 11 years, 318 days, 14 hours, 27 minutes, 10.7 seconds. Its synodical revolution is about 399 days. Before its opposition with the sun, and at about 115° from it, its motion becomes retrograde, and its velocity continually augments till the moment of opposition, after which it diminishes, and when at about 115° from the sun, its motion changes from retrograde to direct. The duration of this retrograde motion is about 121 days, and the arc of retrogradation about 10 degrees: and it may be observed as a general rule with the superior planets, that the farther they are from the sun, the less is their arc of retrogradation; but the longer time is taken in describing it, for were the distance of planets indefinitely great, the arc of retrogradation would be extremely small, and its retrograde motion would last half a year, resembling the effect of parallax of a fixed star, if ever this should be rendered sensible to our instruments.

Jupiter is, next to Venus, the most brilliant of the planets, and sometimes even surpasses it in brightness. Its apparent diameter is greater at the oppositions, and is then equal to nearly 48"; its mean equatorial diameter is estimated at 38.8". Its figure is an oblate spheroid, the proportion of its equatorial to its polar axis being about 14 to 13. La Place from theory deduces this proportion to be 1,000,000 to 9,286,922, a result obtained from computing the effect of the equatorial regions of the planet in disturbing the nodes of the satellites. Almost every person is sufficiently acquainted with the telescopic appearance of Jupiter, to know that its surface is remarkable for being always covered with a number of belts or stripes of various shades. These appearances differ much at different times, and even at the same time in telescopes of different powers. Usually these belts seem to be of an uniform tint; but in very favourable weather, they sometimes appear to consist of a number of curved lines, like the strokes of an engraving. *Figs.* 143, 144, 145, 146. *Plate XVI.* *Astronomy*, represent four views of this planet, as given by Dr. Herschel and Mr. Schroeter.

These belts were first observed at Naples by Zuppi and Bartoli, two Jesuits; and about the year 1660, they were observed by Campani, with refracting telescopes of his own construction, and not much inferior in distinctness to those of the present day; the great modern improvement in refracting telescopes, consisting rather in the reduction of their size than in the increase of their magnifying power.

Jupiter is accompanied by four satellites, which were discovered by Galileo, the 8th of January 1610. He at first took them for telescopic fixed stars; but continued observation soon convinced him that they really accompanied the planet. The relative situation of these small bodies changes at every instant: they oscillate on each side the planet, and it is by the extent of these oscillations that the rank of these satellites is determined; that being called the first satellite, whose oscillation is the least. They are sometimes seen to pass over the disc of the planet, and project a shadow in the form of a well-defined black spot, which then describes a chord of this disc.

Jupiter and his satellites, therefore, are opaque bodies, enlightened

enlightened by the sun; and when the latter interpose between the sun and Jupiter, they produce real solar eclipses, precisely similar to those which the moon occasions on the earth.

This phenomenon leads to the explanation of another which the satellites present. They are often observed to disappear, though at some distance from the disc of the planet: the third and fourth re-appear sometimes on the same side of the disc.

The shadow which Jupiter projects behind it, (relatively to the sun,) is the only cause that can explain these disappearances, which are perfectly similar to eclipses of the moon.

The circumstances which accompany them leave no doubt of the reality of this cause. The satellites are always observed to disappear on the side of the disc opposite to the sun, and consequently on the same side to which the conical shadow is projected. They are eclipsed nearest the disc, when the planet is nearest to its opposition.

Finally, the duration of these eclipses answers to the time which should elapse while they traverse the shadow of Jupiter.

Thus it appears that these satellites move from west to east, in returning orbits round the planet. Observations of their eclipses are the most exact means of determining their motions. Their mean sidereal and synodical revolutions, as seen from the centre of Jupiter, are very accurately determined by comparing eclipses at long intervals from each other, and observed near the opposition of the planet. It is thus discovered that the motion of the satellites of Jupiter is nearly circular and uniform, because this hypothesis corresponds very nearly with those eclipses which happen when we see this planet in the same position relatively to the sun. Therefore, the positions of the satellites at every instant, as seen from the centre of Jupiter, may be determined. From hence results a simple and sufficiently exact method of comparing with each other the distances of Jupiter and of the sun from the earth:—a method which the ancient astronomers did not possess. For the parallax of Jupiter is insensible even to the precision of modern observations, when it is nearest to us. They only judged of its distance by the time of its revolution; as they estimated those planets to be the farthest from us, whose period of revolution was the longest.

Let us suppose that the total duration of an eclipse of the third satellite has been observed. At the middle of the eclipse, the satellite, seen from the centre of Jupiter, is nearly in opposition to the sun. Its sidereal position, observed from this centre, (which may easily be deduced from

its mean motion,) is, therefore, the same as that of the centre of Jupiter seen from the centre of the sun.

Direct observation, or the known motion of the sun, gives the position of the earth as seen from its centre. Thus, supposing a triangle to be formed by the right lines which join the centres of the sun, the earth, and Jupiter, we have given in this triangle the angle at the sun, observation will give that at the earth, and we shall obtain the rectilinear distance from Jupiter to the earth and to the sun, at the instant of the middle of the eclipse, in parts of the distance from the sun to the earth.

It is found by these means that Jupiter is at least five times farther from us than the sun, when its apparent diameter is $38'.3$. The diameter of the earth, at the same distance, would not subtend an angle of $3''.5$; the volume of Jupiter is, therefore, at least a thousand times greater than that of the earth.

The apparent diameters of these satellites being insensible, their magnitude cannot be exactly measured. An attempt has been made to appreciate it, by the time they take to penetrate the shadow of the planet. But there is a great discordance in the observations that have been made to ascertain this circumstance. This arises from the various powers of telescopes, the different degrees of perfection in the sight of the observer, the state of the atmosphere, the altitude of the satellites above the horizon, their apparent distance from Jupiter, and the change of the hemisphere presented to us. The comparative brightness is independent of the four first causes, which only alter their proportional light, and ought, therefore, to afford information concerning the rotatory motion of these bodies. Dr. Herschel, who is occupied in this delicate investigation, has observed that they surpass each other alternately in brilliance:—a circumstance which enables us to judge of the *maximum* and *minimum* of their light. The relation of this *maximum* and *minimum* to their mutual positions has persuaded him, that they turn upon their own axis, like the moon in a period equal to the duration of their revolution round Jupiter: a result which Maraldi had already deduced with regard to the fourth satellite, from the returns of the same spot observed on its disc in its passage over the planet.

The great distance of the celestial bodies weakens the phenomena which their surfaces present, till they are reduced to slight variations of light, which escape the first view, and are only rendered sensible by a long course of observations. But information derived from this source ought to be received with the greatest caution; considering how much we may be misled, on such occasions, by the effect of imagination.

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TABLE I. Epochs of the Mean Longitude of Jupiter, with the Arguments of the Equations.

	Mean Long.	Aphelion.	Node.	Arg.	Arg.	Arg.	Arg.	Arg.	Arg.	Arg.	Arg.	
Years.	S. D. M. S.	S. D. M. S.	S. D. M. S.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	
Nat. J. C. 0	4 29 32 41.8	5 12 46 27	2 20 33 8	2487	9957	2467	2290	511	981	220	234	
100	10 5 50 15.0	5 14 21 0	2 21 32 38	2841	6374	9237	5391	223	482	974	629	
1400	5 27 38 26.4	6 4 50 10	3 4 26 8	7451	9796	7270	7002	473	997	779	762	
1500	11 3 55 59.6	6 6 24 43	3 5 25 38	7806	6213	4040	0203	185	498	533	157	
B. N. S. 1600	4 9 23 40.2	6 7 59 14	3 6 25 7	8145	2626	0772	3381	893	995	286	550	
C. 1700	9 15 36 14.2	6 9 33 47	3 7 24 37	8500	9043	7543	6579	605	495	040	945	
B. 1740	2 0 7 15.3	6 10 11 37	3 7 48 25	8641	5610	4251	9860	289	896	742	303	
B. 1760	10 7 22 46.0	6 10 30 31	3 8 0 19	8712	5893	7605	6500	632	596	093	982	
B. 1780	6 14 38 16.6	6 10 49 26	3 8 12 13	8783	2177	0959	3140	974	296	444	661	
B.	1786	0 16 46 26.3	6 10 55 6	3 8 15 47	1804	3162	4966	8131	677	406	549	865
	1787	1 17 6 58.0	6 10 56 3	3 8 16 23	2308	3326	5633	8962	794	591	566	899
	1788	2 17 32 28.9	6 10 57 0	3 8 16 59	2812	3490	6301	9796	911	777	584	933
	1789	3 17 53 0.6	6 10 57 57	3 8 17 34	3315	3654	6969	0628	028	961	602	967
	1790	4 18 13 32.4	6 10 58 54	3 8 18 10	3819	3818	7636	1459	145	146	619	001
B.	1791	5 18 34 4.1	6 10 59 50	3 8 18 46	4322	3982	8304	2290	262	331	637	034
	1792	6 18 59 35.0	6 11 0 47	3 8 19 21	4826	4146	8971	3124	379	516	654	068
	1793	7 19 20 6.8	6 11 1 44	3 8 19 57	5329	4310	9639	3956	496	701	672	102
	1794	8 19 40 38.5	6 11 2 41	3 8 20 33	5833	4474	0307	4787	614	886	689	136
	1795	9 20 1 10.2	6 11 3 37	3 8 21 9	6337	4639	0974	5618	731	071	707	170
B.	1796	10 20 26 41.1	6 11 4 34	3 8 21 44	6840	4803	1642	6452	848	257	724	204
	1797	11 20 47 12.9	6 11 5 31	3 8 22 20	7344	4967	2310	7284	965	441	742	238
	1798	0 21 7 44.6	6 11 6 28	3 8 22 56	7847	5131	2977	8115	082	626	760	272
	1799	1 21 28 16.4	6 11 7 24	3 8 23 31	8351	5295	3645	8946	199	811	777	306
	C. 1800	2 21 48 48.1	6 11 8 21	3 8 24 7	8854	5459	4313	9778	316	996	795	340
B.	1801	3 22 9 19.9	6 11 9 18	3 8 24 43	9358	5624	4981	0609	433	181	812	374
	1802	4 22 29 51.6	6 11 10 14	3 8 25 18	9861	5788	5648	1441	550	366	830	408
	1803	5 22 50 23.4	6 11 11 11	3 8 25 54	0365	5952	6316	2272	668	551	847	442
	1804	6 23 15 54.3	6 11 12 8	3 8 26 30	0868	6116	6984	3106	785	736	865	476
	1805	7 23 36 26.0	6 11 13 5	3 8 27 6	1372	6280	7651	3938	902	921	882	510
B.	1806	7 23 56 57.8	6 11 14 1	3 8 27 41	1876	6444	8319	4769	019	106	900	544
	1807	9 24 17 29.5	6 11 14 58	3 8 28 17	2379	6609	8987	5600	136	291	917	578
	1808	10 24 43 0.4	6 11 15 55	3 8 28 53	2883	6773	9655	6434	253	476	935	612
	1809	11 25 3 32.2	6 11 16 52	3 8 29 28	3386	6937	0322	7265	370	661	952	646
	1810	0 25 24 3.9	6 11 17 48	3 8 30 4	3890	7101	0990	8097	487	846	970	680
B.	1811	1 25 44 35.7	6 11 18 5	3 8 30 40	4393	7265	1658	8928	605	031	988	713
	1812	2 26 10 6.5	6 11 19 42	3 8 31 15	4897	7429	2325	9762	722	216	005	747
	1813	3 26 30 38.2	6 11 20 39	3 8 31 51	5401	7593	2993	0593	839	401	023	781
	1814	4 26 51 10.0	6 11 21 35	3 8 32 26	5904	7757	3660	1425	956	586	040	815
	1815	5 27 11 41.7	6 11 22 32	3 8 33 2	6408	7922	4328	2256	073	871	058	849
B.	1816	6 27 37 12.6	6 11 23 29	3 8 33 38	6911	8086	4996	3090	190	956	075	883
	1817	7 27 57 44.4	6 11 24 26	3 8 34 13	7415	8250	5664	3921	308	141	093	917
	1818	8 28 18 16.1	6 11 25 22	3 8 34 49	7918	8414	6331	4753	425	326	110	951
	1819	9 28 38 47.9	6 11 26 19	3 8 35 25	8422	8578	6999	5584	542	511	128	985
	B. 1820	10 29 4 18.8	6 11 27 16	3 8 36 1	8925	8742	7667	6418	659	696	145	019

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TABLE II. Mean Motion of Jupiter for *Julian Years*, with the Arguments of the Equations.

	Years.	Mot. in Long.				Mot. Aph.				Mot. Node.				Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
		S.	D.	M.	S.	S.	D.	M.	S.	S.	D.	M.	S.								
B.	1	1	0	20	31.7	0	0	0	57	0	0	0	36	0504	0164	0668	0831	117	185	018	034
	2	2	0	41	3.5	0	0	1	53	0	0	1	11	1007	0328	1335	1663	234	370	035	068
	3	3	1	1	35.2	0	0	2	50	0	0	1	47	1511	0493	2003	2494	351	555	053	102
	4	4	1	27	6.1	0	0	3	47	0	0	2	23	2014	0657	2671	3328	468	740	070	136
	5	5	1	47	37.9	0	0	4	44	0	0	2	58	2518	0821	3339	4159	586	925	088	170
B.	6	6	2	8	9.6	0	0	5	40	0	0	3	34	3021	0985	4006	4991	703	110	105	204
	7	7	2	28	41.4	0	0	6	37	0	0	4	10	3525	1149	4674	5822	820	295	123	238
	8	8	2	54	12.3	0	0	7	34	0	0	4	46	4028	1313	5342	6656	937	480	140	272
	9	9	3	14	44.0	0	0	8	31	0	0	5	21	4532	1478	6009	7488	054	665	158	306
	10	10	3	35	15.8	0	0	9	27	0	0	5	57	5035	1642	6677	8319	171	850	175	339
B.	11	11	3	55	47.5	0	0	10	24	0	0	6	33	5539	1806	7345	9150	288	035	193	373
	12	0	4	21	18.4	0	0	11	21	0	0	7	8	6043	1970	8012	9984	405	220	210	407
	13	1	4	41	50.1	0	0	12	18	0	0	7	44	6546	2134	8680	0816	523	405	228	441
	14	2	5	2	21.9	0	0	13	14	0	0	8	20	7050	2298	9348	1647	640	590	245	475
	15	3	5	22	53.6	0	0	14	11	0	0	8	56	7553	2463	0016	2478	757	775	263	509
B.	16	4	5	48	24.5	0	0	15	8	0	0	9	31	8057	2627	0683	3312	874	960	281	543
	17	5	6	8	56.3	0	0	16	4	0	0	10	7	8560	2791	1351	4144	991	145	298	577
	18	6	6	29	28.0	0	0	17	1	0	0	10	43	9064	2955	2019	4975	108	330	316	611
	19	7	6	49	59.8	0	0	17	58	0	0	11	18	9567	3119	2686	5806	225	515	333	645
	20	8	7	15	30.6	0	0	18	55	0	0	11	54	0071	3283	3354	6640	342	700	351	679
Biflexiles.	40	4	14	31	1.3	0	0	37	49	0	0	23	48	0142	6567	6708	3280	685	400	702	358
	60	0	21	46	31.9	0	0	56	44	0	0	35	42	0213	9850	0062	9920	027	101	052	037
	80	8	29	2	2.5	0	1	15	38	0	0	47	36	0284	3134	3416	6561	369	801	403	716
	100	5	6	17	33.2	0	1	34	33	0	0	59	30	0355	6417	6770	3201	712	501	754	395
	200	10	12	35	6.4	0	3	9	6	0	1	59	0	0709	2834	3541	6402	423	002	508	790
	300	3	18	52	39.6	0	4	43	39	0	2	58	30	1064	9251	0311	9602	135	504	262	184
	400	8	25	10	12.7	0	6	18	12	0	3	58	0	1418	5668	7081	2803	846	005	017	579
	500	2	1	27	45.9	0	7	52	45	0	4	57	30	1773	2085	3852	6004	558	506	771	974
	600	7	7	45	19.1	0	9	27	19	0	5	57	0	2128	5802	0622	9205	269	007	525	369
	700	0	14	2	52.3	0	11	1	52	0	6	56	30	2482	4920	7392	2406	981	508	279	764
	800	5	20	20	25.5	0	12	36	25	0	7	56	0	2837	1337	4162	5607	693	010	033	158
	900	10	26	37	58.7	0	14	10	58	0	8	55	30	3191	7754	0933	8807	404	511	787	553
	1000	4	2	55	31.8	0	15	45	31	0	9	55	0	3546	4171	7703	2008	116	012	542	948
	2000	8	5	51	3.7	1	1	31	2	0	19	50	0	7092	8342	5406	4017	231	024	083	896
	3000	0	8	46	35.5	1	17	16	33	0	29	45	0	0638	2513	3109	6025	347	036	625	844
	4000	4	11	42	7.4	2	3	2	4	1	9	49	0	4184	6684	0812	8033	463	048	166	792
	5000	8	14	37	39.2	2	18	47	35	1	19	35	0	7730	0856	8515	0042	579	059	708	740
	6000	0	17	33	11.0	3	4	33	6	1	29	30	0	1276	5027	6219	2050	694	071	249	688

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TABLE III. Mean Motion of Jupiter for *Months*, with the Arguments of the Equations.

Months.	Mot. Long.			Aph.	Node	Arg.								
	D.	M.	s.	Sec.	Sec.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.	Arg. X.
Jan.	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0
Feb.	2	34	37.2	5	3	43	14	57	71	10	16	1	3	
March	4	54	16.6	9	6	81	27	108	134	19	30	3	6	
April	7	28	53.9	14	9	124	41	165	205	29	45	4	8	
May	9	58	31.8	19	12	165	54	219	273	38	61	6	11	
June	12	33	9.0	23	15	208	65	276	344	48	76	7	14	
July	15	2	47.0	28	18	250	81	331	412	58	91	9	17	
Aug.	17	37	24.2	33	21	292	95	388	483	68	107	10	20	
Sept.	20	12	1.4	38	24	335	109	444	553	78	123	12	23	
Oct.	22	41	39.4	42	27	376	123	499	622	88	138	13	25	
Nov.	25	16	16.6	47	30	419	137	556	692	97	154	15	28	
Dec.	27	45	54.5	52	33	460	150	611	761	107	169	16	31	

TABLE IV. Mean Motion of Jupiter for *Hours* and *Minutes*.

Hours.	Mot. Lon.		Hours.	Mot. Lon.		Min.	Mot. Lon.		Min.	Mot. Lon.	
	M.	S.		M.	S.		Sec.	Sec.			
1	0	12.5	13	2	42.1	1	0.2	27	5.6		
2	0	24.9	14	2	54.6	2	0.4	30	6.2		
3	0	37.4	15	3	7.0	3	0.6	33	6.9		
4	0	49.9	16	3	19.5	4	0.8	36	7.5		
5	1	2.3	17	3	32.0	5	1.0	39	8.1		
6	1	14.8	18	3	44.4	6	1.2	42	8.7		
7	1	27.3	19	3	56.9	9	1.9	45	9.4		
8	1	39.8	20	4	9.4	12	2.5	48	10.0		
9	1	52.2	21	4	21.9	15	3.1	51	10.6		
10	2	4.7	22	4	34.3	18	3.7	54	11.2		
11	2	17.2	23	4	46.8	21	4.4	57	11.8		
12	2	29.6	24	4	59.3	24	5.0	60	12.5		

TABLE V. Mean Motion of Jupiter for *Days*, with the Arguments of the Equations.

Days of the Month.	Motion in Longitude.			Mot. Aphel.	Mot. Node.	Arg.								
	D.	M.	s.	Sec.	Sec.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.	Arg. X.
1	0	4	59.3	0	0	3	1	2	2	0	1	0	0	0
2	0	9	58.5	0	0	4	1	4	5	1	1	0	0	0
3	0	14	57.8	0	0	5	1	7	7	1	2	0	0	0
4	0	19	57.1	1	0	6	2	9	9	1	2	0	0	0
5	0	24	56.3	1	0	7	2	11	11	2	3	0	0	1
6	0	29	55.6	1	1	8	3	14	14	3	3	0	1	
7	0	34	54.9	1	1	10	3	16	16	4	4	0	1	
8	0	39	54.1	1	1	11	4	18	18	5	5	0	1	
9	0	44	53.4	1	1	12	4	20	20	6	6	0	1	
10	0	49	52.7	2	1	14	5	23	23	7	7	0	1	
11	0	54	51.9	2	1	15	5	25	25	8	8	0	1	
12	0	59	51.2	2	1	16	5	27	27	9	9	0	1	
13	1	4	50.4	2	1	17	6	30	30	10	10	0	1	
14	1	9	49.7	2	1	19	6	32	32	11	11	0	1	
15	1	14	49.0	2	1	21	7	34	34	12	12	0	1	
16	1	19	48.2	3	2	22	7	36	36	13	13	0	1	2
17	1	24	47.5	3	2	23	8	39	39	14	14	0	1	2
18	1	29	46.8	3	2	25	8	41	41	15	15	0	1	2
19	1	34	46.0	3	2	26	9	43	43	16	16	0	1	2
20	1	39	45.3	3	2	28	9	46	46	17	17	0	1	2
21	1	44	44.6	3	2	29	9	48	48	18	18	0	1	2
22	1	49	43.8	3	2	30	10	50	50	19	19	0	1	2
23	1	54	43.1	4	2	32	10	52	52	20	20	0	1	2
24	1	59	42.4	4	2	33	11	55	55	21	21	0	1	2
25	2	4	41.6	4	2	35	11	57	57	22	22	0	1	2
26	2	9	40.9	4	3	36	12	59	59	23	23	0	1	2
27	2	14	40.2	4	3	37	12	61	61	24	24	0	1	3
28	2	19	39.4	4	3	39	13	64	64	25	25	0	1	3
29	2	24	38.7	5	3	40	13	66	66	26	26	0	1	3
30	2	29	38.0	5	3	41	13	68	68	27	27	0	1	3
31	2	34	37.2	5	3	43	14	71	71	28	28	0	1	3

In the Months January and February of a Bissextile Year, subtract 1 from the given Day of the Month.

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TABLE VI. The great Inequality of the Motion of Jupiter, with the Corrections of the Arguments which regulate the other Inequalities.

Years.	Equations.		Diff. Sec.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.	Arg. IX.
	M.	S.									
1550	- 1	18.5	86.2	- 2	- 3	- 5	- 9	- 1	- 0	+ 0	+ 0
1560	+ 0	7.7	86.0	+ 0	+ 0	+ 0	+ 1	+ 0	+ 0	- 0	- 0
1570	1	33.7	85.4	2	4	6	11	1	1	- 1	0
1580	2	59.1	84.6	5	8	12	18	2	1	- 1	0
1590	4	23.7	83.3	7	12	18	30	3	2	- 2	0
1600	5	47.0	81.6	9	15	24	39	3	2	- 2	- 1
1610	7	8.6	79.6	11	19	30	49	4	3	- 3	- 1
1620	8	28.2	77.1	13	22	35	58	5	3	- 3	- 1
1630	9	45.3	74.3	15	27	41	66	6	3	- 4	- 1
1640	10	59.6	71.2	17	29	46	75	6	4	- 4	- 1
1650	12	10.8	67.7	19	32	51	83	7	4	- 4	- 1
1660	13	18.5	63.9	21	35	56	91	8	5	- 5	- 1
1670	14	22.4	59.9	22	38	60	98	8	5	- 5	- 2
1680	15	22.3	55.4	24	40	64	105	9	5	- 6	- 2
1690	16	17.7	50.9	25	43	68	111	9	6	- 6	- 2
1700	17	8.6	46.0	27	45	72	117	10	6	- 6	- 2
1710	17	54.6	41.1	28	47	75	122	10	6	- 7	- 2
1720	18	35.6	35.6	29	49	78	127	11	7	- 7	- 2
1730	19	11.2	30.3	30	50	80	131	11	7	- 7	- 2
1740	19	41.5	24.7	30	52	82	134	11	7	- 7	- 2
1750	20	6.2	19.1	31	53	84	137	12	7	- 7	- 2
1760	20	25.3	13.3	32	54	85	139	12	7	- 8	- 2
1770	20	38.6	7.4	32	54	86	141	12	7	- 8	- 2
1780	20	46.0	1.7	32	55	87	141	12	7	- 8	- 2
1790	20	47.7	- 4.2	32	55	87	142	12	7	- 8	- 2
1800	20	43.5	10.0	32	54	87	141	12	7	- 8	- 2
1810	20	33.5	15.8	32	54	86	140	12	7	- 8	- 2
1820	20	17.7	21.5	31	53	85	138	12	7	- 7	- 2
1830	19	56.2	27.1	31	52	83	136	11	7	- 7	- 2
1840	19	29.1	32.5	30	51	81	133	11	7	- 7	- 2
1850	18	56.6	37.8	29	50	79	129	11	7	- 7	- 2
1860	18	18.8	42.9	28	48	77	125	10	6	- 7	- 2
1870	17	35.9	47.9	27	46	74	120	10	6	- 6	- 2
1880	16	48.0	52.7	26	44	70	114	10	6	- 6	- 8
1890	15	55.3	56.9	25	42	67	109	9	6	- 6	- 2
1900	14	58.4	61.1	23	39	62	102	9	5	- 5	- 2
1910	13	57.3	65.1	22	37	58	95	8	5	- 5	- 2
1920	12	52.2	68.6	20	34	54	88	7	5	- 5	- 2
1930	11	43.6	71.8	18	31	49	80	7	4	- 4	- 1
1940	10	31.8	74.8	16	28	44	72	6	4	- 4	- 1
1950	9	17.0	77.3	14	25	39	64	5	3	- 3	- 1
1960	7	59.7	79.5	12	21	33	54	5	3	- 3	- 1
1970	6	40.2	81.4	10	18	28	45	4	2	- 2	- 1
1980	5	18.8	82.8	8	14	22	36	3	2	- 2	- 1
1990	3	56.0	83.8	6	10	16	27	2	1	- 1	- 0
2000	2	32.2	84.5	4	7	10	17	1	1	- 1	- 0
2010	+ 1	7.7	84.7	+ 2	+ 3	+ 5	+ 8	+ 1	+ 0	- 0	- 0
2020	- 0	17.0		- 0	- 0	- 1	- 2	- 0	- 0	+ 0	+ 0

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TABLE VII. Equation of Jupiter's Orbit for 1750, with the Secular Variation.

Argument. Long. 24 cor. by Tab. VI.—Aphelion, or mean Anomaly.

Degrees.	Sig. O.			Sig. I.			Sig. II.			Degrees.
	Equation.	Diff.	Sec. Var.	Equation.	Diff.	Sec. Var.	Equation.	Diff.	Sec. Var.	
	—		—	—		—	—		—	
	D. M. S.	M. S.	Sec.	D. M. S.	M. S.	Sec.	D. M. S.	M. S.	Sec.	
0	0 0 0.0	5 26.5	0.00	2 37 1.8	4 48.1	25.00	4 37 36.3	2 59.8	45.06	30
1	0 5 26.5	5 26.4	0.86	2 41 49.9	4 45.5	25.79	4 40 36.1	2 55.2	45.58	29
2	0 10 52.9	5 26.2	1.72	2 46 35.4	4 43.0	26.55	4 43 31.3	2 50.5	46.10	28
3	0 16 19.1	5 26.0	2.58	2 51 18.4	4 40.3	27.31	4 46 21.8	2 45.7	46.61	27
4	0 21 45.1	5 25.6	3.44	2 55 58.7	4 37.5	28.08	4 49 7.5	2 40.8	47.09	26
5	0 27 10.7	5 25.2	4.31	3 0 36.2	4 34.6	28.83	4 51 48.3	2 35.9	47.57	25
6	0 32 35.9	5 24.7	5.16	3 5 10.8	4 31.7	29.57	4 54 24.2	2 30.9	48.03	24
7	0 38 0.6	5 24.2	6.01	3 9 42.5	4 28.7	30.32	4 56 55.1	2 25.9	48.49	23
8	0 43 24.8	5 23.5	6.88	3 14 11.2	4 25.6	31.04	4 59 21.0	2 20.9	48.94	22
9	0 48 48.3	5 22.7	7.73	3 18 36.8	4 22.6	31.77	5 1 41.9	2 15.7	49.37	21
10	0 54 11.0	5 21.9	8.57	3 22 59.4	4 19.3	32.48	5 3 57.6	2 10.6	49.78	20
11	0 59 32.9	5 21.0	9.42	3 27 18.7	4 16.0	33.20	5 6 8.2	2 5.3	50.18	19
12	1 4 53.9	5 20.1	10.27	3 31 34.7	4 12.6	33.90	5 8 13.5	2 0.0	50.57	18
13	1 10 14.0	5 18.9	11.12	3 35 47.3	4 9.2	34.60	5 10 13.5	1 54.7	50.95	17
14	1 15 32.9	5 17.6	11.97	3 39 56.5	4 5.6	35.29	5 12 8.2	1 49.3	51.31	16
15	1 20 50.5	5 16.5	12.81	3 44 2.1	4 2.0	35.97	5 13 57.5	1 43.9	51.65	15
16	1 26 7.0	5 15.3	13.65	3 48 4.1	3 58.4	36.63	5 15 41.4	1 38.4	51.99	14
17	1 31 22.3	5 13.8	14.49	3 52 2.5	3 54.8	37.30	5 17 19.8	1 32.9	52.32	13
18	1 36 36.1	5 12.2	15.32	3 55 57.3	3 50.8	37.95	5 18 52.7	1 27.3	52.62	12
19	1 41 48.3	5 10.7	16.15	3 59 48.1	3 46.9	38.59	5 20 20.0	1 21.8	52.91	11
20	1 46 59.0	5 9.0	16.98	4 3 35.0	3 43.0	39.23	5 21 41.8	1 16.1	53.20	10
21	1 52 8.0	5 7.4	17.80	4 7 18.0	3 39.0	39.86	5 22 57.9	1 10.4	53.46	9
22	1 57 15.4	5 5.5	18.62	4 10 57.0	3 34.9	40.49	5 24 8.3	1 4.7	53.71	8
23	2 2 20.9	5 3.6	19.43	4 14 31.9	3 30.7	41.08	5 25 13.0	0 58.9	53.94	7
24	2 7 24.5	5 1.6	20.24	4 18 2.6	3 26.5	41.68	5 26 11.9	0 53.1	54.17	6
25	2 12 26.1	4 59.6	21.05	4 21 29.1	3 22.3	42.27	5 27 5.0	0 47.3	54.38	5
26	2 17 25.7	4 57.4	21.85	4 24 51.4	3 17.9	42.85	5 27 52.3	0 41.4	54.56	4
27	2 22 23.1	4 55.2	22.65	4 28 9.3	3 13.5	43.41	5 28 33.7	0 35.5	54.73	3
28	2 27 18.3	4 52.9	23.44	4 31 22.8	3 9.0	43.97	5 29 9.2	0 29.7	54.89	2
29	2 32 11.2	4 50.6	24.22	4 34 31.8	3 4.5	44.52	5 29 38.9	0 23.7	55.02	1
30	2 37 1.8		25.00	4 37 36.3		45.06	5 30 2.6		55.15	0
	+ Sig. XI.		+	+ Sig. X.		+	+ Sig. IX.		+	

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TABLE VII. Equation of Jupiter's Orbit for 1750, with the Secular Variation.

Argument. Long. 24 cor. by Tab. VI.—Aphelion, or mean Anomaly.

Degrees.	Sig. III.			Sig. IV.			Sig. V.			Degrees.
	Equation.	Diff.	Sec. Var.	Equation.	Diff.	Sec. Var.	Equation.	Diff.	Sec. Var.	
	—		—	—		—	—		—	
	D. M. S.	M. S.	Sec.	D. M. S.	M. S.	Sec.	D. M. S.	M. S.	Sec.	
0	5 30 2.6	0 17.7	55.15	4 54 45.6	2 44.2	50.75	2 54 15.1	5 11.8	30.78	30
1	5 30 20.3	0 11.7	55.26	4 52 1.4	2 50.1	50.40	2 49 3.3	5 15.5	29.88	29
2	5 30 32.0	+0 5.7	55.35	4 49 11.3	2 55.8	49.97	2 43 47.8	5 19.0	28.96	28
3	5 30 37.7	—0 0.3	55.43	4 46 15.5	3 1.5	49.51	2 38 28.8	5 22.4	28.03	27
4	5 30 37.4	0 6.4	55.48	4 43 14.0	3 7.3	49.03	2 33 6.4	5 25.7	27.09	26
5	5 30 31.0	0 12.5	55.52	4 40 6.7	3 12.8	48.53	2 27 40.7	5 28.9	26.15	25
6	5 30 18.5	0 18.6	55.55	4 36 53.9	3 18.5	48.02	2 22 11.8	5 32.0	25.19	24
7	5 29 59.9	0 24.6	55.56	4 33 35.4	3 24.0	47.48	2 16 39.8	5 34.9	24.23	23
8	5 29 35.3	0 30.8	55.55	4 30 11.4	3 29.5	46.95	2 11 4.9	5 37.7	23.25	22
9	5 29 4.5	0 37.0	55.52	4 26 41.9	3 34.9	46.38	2 5 27.2	5 40.4	22.26	21
10	5 28 27.5	0 43.0	55.48	4 23 7.0	3 40.3	45.79	1 59 46.8	5 43.0	21.26	20
11	5 27 44.5	0 49.1	55.41	4 19 26.7	3 45.7	45.19	1 54 3.8	5 45.5	20.25	19
12	5 26 55.4	0 55.3	55.33	4 15 41.0	3 50.9	44.57	1 48 18.3	5 47.9	19.24	18
13	5 26 0.1	1 1.6	55.24	4 11 50.1	3 55.9	43.92	1 42 30.4	5 50.2	18.21	17
14	5 24 58.5	1 7.6	55.11	4 7 54.2	4 1.1	43.29	1 36 40.2	5 52.2	17.19	16
15	5 23 50.9	1 13.8	54.99	4 3 53.1	4 6.3	42.63	1 30 48.0	5 54.2	16.15	15
16	5 22 37.1	1 19.8	54.85	3 59 46.8	4 11.2	41.95	1 24 53.8	5 56.0	15.10	14
17	5 21 17.3	1 26.0	54.67	3 55 35.6	4 16.1	41.24	1 18 57.8	5 57.8	14.04	13
18	5 19 51.3	1 32.2	54.49	3 51 19.5	4 20.9	40.52	1 13 0.0	5 59.4	12.98	12
19	5 18 19.1	1 38.3	54.28	3 46 58.6	4 25.6	39.80	1 7 0.6	6 0.8	11.92	11
20	5 16 40.8	1 44.4	54.06	3 42 33.0	4 30.3	39.04	1 0 59.8	6 2.1	10.85	10
21	5 14 56.4	1 50.5	53.81	3 38 2.7	4 34.8	38.29	0 54 57.7	6 3.4	9.79	9
22	5 13 5.9	1 56.5	53.56	3 33 27.9	4 39.4	37.50	0 48 54.3	6 4.5	8.72	8
23	5 11 9.4	2 2.6	53.29	3 28 48.5	4 43.7	36.72	0 42 49.8	6 5.3	7.63	7
24	5 9 6.8	2 8.6	52.99	4 24 4.8	4 48.0	35.91	0 36 44.5	6 6.1	6.54	6
25	5 6 58.2	2 14.7	52.67	3 19 16.8	4 52.3	35.08	0 30 38.4	6 6.8	5.45	5
26	5 4 43.5	2 20.5	52.35	3 14 24.5	4 56.4	34.26	0 24 31.6	6 7.4	4.36	4
27	5 2 23.0	2 26.6	51.99	3 9 28.1	5 0.5	33.40	0 18 24.2	6 7.9	3.28	3
28	4 59 56.4	2 32.5	51.62	3 4 27.6	5 4.4	32.55	0 12 16.3	6 8.1	2.18	2
29	4 57 23.9	2 38.3	51.22	2 59 23.2	5 8.1	31.67	0 6 8.2	6 8.2	1.10	1
30	4 54 45.6		50.82	2 54 15.1		30.78	0 0 0.0		0.00	0
	+ Sig. VIII.		+	+ Sig. VII.		+	+ Sig. VI.		+	

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TABLE VIII. Equation II.

Argument II.								
Arg. II.	Equat. II.		Diff.	Arg. II.	Equat. II.		Diff.	Arg. II.
	M.	S.			M.	S.		
0	4	14.7	24.6	3400	0	5.2	4.2	6700
100	4	39.3	24.0	3500	0	1.0	1.0	6800
200	5	3.3		3600	0	0.0		6900
			22.9				1.9	
300	5	26.2	21.2	3700	0	1.9	4.9	7000
400	5	47.4	19.3	3800	0	6.8	8.0	7100
500	6	6.7		3900	0	14.8		7200
			16.7				10.9	
600	6	23.4	13.7	4000	0	25.7	13.7	7300
700	6	37.1	10.9	4100	0	39.4	16.4	7400
800	6	48.0		4200	0	55.8		7500
			7.1				18.9	
900	6	55.1	3.7	4300	1	14.7	21.2	7600
1000	6	58.8	0.2	4400	1	35.9	23.2	7700
1100	6	59.0		4500	1	59.1		7800
			3.5				25.0	
1200	6	55.5	6.9	4600	2	24.1	26.3	7900
1300	6	45.6	10.2	4700	2	50.4	27.5	8000
1400	6	38.4		4800	3	17.9		8100
			13.4				28.3	
1500	6	25.0	16.2	4900	3	46.2	28.5	8200
1600	6	8.8	18.7	5000	4	14.7	28.5	8300
1700	5	50.1		5100	4	43.2		8400
			20.9				28.3	
1800	5	29.2	22.9	5200	5	11.5	27.5	8500
1900	5	6.3	23.9	5300	5	39.0	26.3	8600
2000	4	42.4		5400	6	5.3		8700
			25.1				25.0	
2100	4	17.3	25.6	5500	6	30.3	23.2	8800
2200	3	51.7	26.0	5600	6	53.5	21.2	8900
2300	3	25.7		5700	7	14.7		9000
			25.7				18.9	
2400	3	0.0	25.0	5800	7	33.6	16.4	9100
2500	2	35.0		5900	7	50.0	13.7	9200
2600	2	10.8	24.2	6000	8	3.7		9300
			22.8				10.9	
2700	1	48.0	21.4	6100	8	14.6	8.0	9400
2800	1	26.6	19.5	6200	8	22.6	4.9	9500
2900	1	7.1	17.4	6300	8	27.5	1.9	9600
3000	0	49.7		6400	8	29.4		9700
			15.0				1.0	
3100	0	34.7	12.6	6500	8	28.4	4.2	9800
3200	0	22.1	9.9	6600	8	24.2	7.0	9900
3300	0	12.2	7.0	6700	8	17.2		10000
3400	0	5.2						

TABLE IX. Equation III.

Argument III.								
Arg. III.	Equat. III.		Diff.	Arg. III.	Equat. III.		Diff.	Arg. III.
	M.	S.			M.	S.		
0	1	46.0	8.5	3400	4	29.4	3.1	6700
100	1	54.5	8.6	3500	4	26.3	3.6	6800
200	2	3.1		3600	4	22.7		6900
			8.6				4.0	
300	2	11.7	8.7	3700	4	18.7	4.5	7000
400	2	20.4	8.7	3800	4	14.2	5.0	7100
500	2	29.1		3900	4	9.2		7200
			8.7				5.5	
600	2	37.8	8.6	4000	4	3.7	5.8	7300
700	1	46.4	8.4	4100	3	57.9	6.2	7400
800	2	54.8		4200	3	51.7		7500
			8.3				6.6	
900	3	3.1	8.2	4300	3	45.1	7.0	7600
1000	3	11.3	7.9	4400	3	38.1	7.3	7700
1100	3	19.2		4500	3	30.8		7800
			7.7				7.6	
1200	3	26.9	7.4	4600	3	23.2	7.8	7900
1300	3	34.3	7.1	4700	3	15.4	8.0	8000
1400	3	41.4		4800	3	7.4		8100
			6.8				8.2	
1500	3	48.2	6.4	4900	2	59.2	8.4	8200
1600	3	54.6	6.1	5000	2	50.8	8.5	8300
1700	4	0.7		5100	2	42.3		8400
			5.7				8.6	
1800	4	6.4	5.2	5200	2	33.7	8.6	8500
1900	4	11.6	4.8	5300	2	25.1	8.7	8600
2000	4	16.4		5400	2	16.4		8700
			4.3				8.7	
2100	4	20.7	3.8	5500	2	7.7	8.7	8800
2200	4	24.5	3.4	5600	1	59.0	8.6	8900
2300	4	27.9		5700	1	50.4		9000
			2.8				8.4	
2400	4	30.7	2.3	5800	1	42.0	8.3	9100
2500	4	33.0	1.7	5900	1	33.7	8.2	9200
2600	4	34.7		6000	1	25.5		9300
			1.2				7.9	
2700	4	35.9	0.7	6100	1	17.6	7.7	9400
2800	4	36.6	0.2	6200	1	9.9	7.4	9500
2900	4	36.8	0.4	6300	1	2.5	7.1	9600
3000	4	36.4		6400	0	55.4		9700
			1.0				6.8	
3100	4	35.4	1.5	6500	0	48.6	6.4	9800
3200	4	33.9	2.0	6600	0	42.2	6.1	9900
3300	4	31.9	2.5	6700	0	36.1		10000
3400	4	29.4						

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TABLE X. Equation IV.

Argument IV.											
Arg. IV.	Equat. IV.		Diff.	Arg. IV.	Equat. IV.		Diff.	Arg. IV.	Equat. IV.		Diff.
	M.	s.			M.	s.			M.	s.	
00	10.2		2.8	3400	2	43.4	2.5	6700	1	28.6	5.5
100	13.0		3.0	3500	2	45.9	2.3	6800	1	23.1	5.4
200	16.0			3600	2	48.2		6900	1	17.7	
			3.3				2.0				5.5
300	19.3		3.6	3700	2	50.2	1.5	7000	1	12.2	5.3
400	22.9		3.8	3800	2	51.7	1.3	7100	1	6.9	5.3
500	26.7			3900	2	53.0		7200	1	1.6	
			4.1				0.9				5.2
600	30.8		4.2	4000	2	53.9	0.6	7300	0	56.4	5.1
700	35.0		4.5	4100	2	54.5	0.3	7400	0	51.3	4.9
800	39.5			4200	2	54.8		7500	0	46.4	
			4.7				0.0				4.8
900	44.2		4.9	4300	2	54.8	0.4	7600	0	41.6	4.6
1000	49.1		5.0	4400	2	54.4	0.8	7700	0	37.0	4.3
1100	54.1			4500	2	53.6		7800	0	32.7	
			5.2				1.2				4.2
1200	59.3		5.2	4600	2	52.4	1.5	7900	0	28.5	4.0
1300	1	4.5	5.3	4700	2	50.9	1.8	8000	0	24.5	3.7
1400	1	9.8		4800	2	49.1		8100	0	20.8	
			5.4				2.1				3.4
1500	1	15.2	5.5	4900	2	47.0	2.4	8200	0	17.4	3.1
1600	1	20.7	5.5	5000	2	44.6	2.8	8300	0	14.3	2.9
1700	1	26.2		5100	2	41.8		8400	0	11.4	
			5.5				3.0				2.5
1800	1	31.7	5.4	5200	2	38.8	3.3	8500	0	8.9	2.3
1900	1	37.1	5.5	5300	2	35.5	3.6	8600	0	6.6	2.0
2000	1	42.6		5400	2	31.9		8700	0	4.6	
			5.3				3.8				1.5
2100	1	47.9	5.3	5500	2	28.1	4.1	8800	0	3.1	1.3
2200	1	53.2	5.2	5600	2	24.0	4.2	8900	0	1.8	0.9
2300	1	58.4		5700	2	19.8		9000	0	0.9	
			5.1				4.5				0.6
2400	2	3.5	4.9	5800	2	15.3	4.7	9100	0	0.3	0.3
2500	2	8.4	4.8	5900	2	10.6	4.9	9200	0	0.0	0.0
2600	2	13.2		6000	2	5.7		9300	0	0.0	
			4.6				5.0				0.4
2700	2	17.8	4.3	6100	2	0.7	5.2	9400	0	0.4	0.8
2800	2	22.1	4.2	6200	1	55.5	5.2	9500	0	1.2	1.2
2900	2	26.3	4.0	6300	1	50.3	5.3	9600	0	2.4	1.5
3000	2	30.3		6400	1	45.0		9700	0	3.9	
			3.7				5.4				1.8
3100	2	34.0	3.4	6500	1	39.6	5.5	9800	0	5.7	2.1
3200	2	37.4	3.1	6600	1	34.1	5.5	9900	0	7.8	2.4
3300	2	40.5	2.9	6700	1	28.6		10000	0	10.2	
3400	2	43.4									

TABLE XI. Equation V.

Argument V.											
Arg. V.	Equat. V.		Diff.	Arg. V.	Equat. V.		Diff.	Arg. V.	Equat. V.		Diff.
	M.	s.			M.	s.			M.	s.	
0	5	4.3		3400	2	53.7		6700	0	17.6	
100	5	10.0	5.7	3500	2	43.2	10.5	6800	0	22.5	4.9
200	5	15.2	5.2	3600	2	32.7	10.5	6900	0	28.1	5.6
			4.5				10.4				6.1
300	5	19.7		3700	2	22.3		7000	0	34.2	
400	5	23.6	3.9	3800	2	12.0	10.3	7100	0	40.8	6.6
500	5	27.0	3.4	3900	2	1.8	10.2	7200	0	48.0	7.2
			2.7				10.0				7.6
600	5	29.7		4000	1	51.8		7300	0	55.6	
700	5	31.7	2.0	4100	1	42.0	9.8	7400	1	3.6	8.0
800	5	33.0	1.3	4200	1	32.5	9.5	7500	1	12.0	8.4
			0.8				9.2				8.8
900	5	33.8		4300	1	23.3		7600	1	20.8	
1000	5	34.0	0.2	4400	1	14.3	9.0	7700	1	29.9	9.1
1100	5	33.4	0.6	4500	1	5.8	8.5	7800	1	39.4	9.5
			1.3				8.1				9.7
1200	5	32.1		4600	0	57.7		7900	1	49.1	
1300	5	30.3	1.8	4700	0	50.0	7.7	8000	1	59.0	9.9
1400	5	27.8	2.5	4800	0	42.7	7.3	8100	2	9.2	10.2
			3.2				6.8				10.4
1500	5	24.6		4900	0	35.9		8200	2	19.6	
1600	5	20.8	3.8	5000	0	29.7	6.2	8300	2	29.9	10.3
1700	5	16.4	4.4	5100	0	24.0	5.7	8400	2	40.3	10.4
			4.9				5.2				10.5
1800	5	11.5		5200	0	18.8		8500	2	50.8	
1900	5	5.9	5.6	5300	0	14.3	4.5	8600	3	1.3	10.5
2000	4	59.8	6.1	5400	0	10.4	3.9	8700	3	11.7	10.4
			6.6				3.4				10.3
2100	4	53.2		5500	0	7.0		8800	3	22.0	
2200	4	46.0	7.2	5600	0	4.3	2.7	8900	3	32.2	10.2
2300	4	38.4	7.6	5700	0	2.3	2.0	9000	3	42.2	10.0
			8.0				1.3				9.8
2400	4	30.4		5800	0	1.0	0.8	9100	3	52.0	
2500	4	22.0	8.4	5900	0	0.2		9200	4	1.5	9.5
2600	4	13.2	8.8	6000	0	0.0	0.2	9300	4	10.7	9.2
			9.1				0.6				9.0
2700	4	4.1		6100	0	0.6	1.3	9400	4	19.7	
2800	3	54.6	9.5	6200	0	1.9	1.8	9500	4	28.2	8.5
2900	3	44.9	9.7	6300	0	3.7	2.5	9600	4	36.3	8.1
3000	3	35.0	9.9	6400	0	6.2		9700	4	44.0	7.7
			10.2				3.2				7.3
3100	3	24.8		6500	0	9.4	3.8	9800	4	51.3	
3200	3	14.4	10.4	6600	0	13.2	4.4	9900	4	58.1	6.8
3300	3	4.1	10.3	6700	0	17.6		10000	5	4.3	6.2
3400	2	53.7	10.4								

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TABLE XII. Equation VI.

Argument VI.					
Arg. VI.	Equat. VI. Sec.	Arg. VI.	Equat. VI. Sec.	Arg. VI.	Equat. VI. Sec.
0	30.2	340	2.2	670	15.5
10	29.7	350	1.7	680	16.5
20	29.2	360	1.3	690	17.5
30	28.6	370	1.0	700	18.5
40	28.0	380	0.7	710	19.5
50	27.3	390	0.4	720	20.5
60	26.5	400	0.2	730	21.5
70	25.8	410	0.1	740	22.4
80	25.0	420	0.0	750	23.3
90	24.1	430	0.0	760	24.2
100	23.2	440	0.1	770	25.1
110	22.3	450	0.2	780	25.9
120	21.4	460	0.4	790	26.6
130	20.4	470	0.7	800	27.4
140	19.5	480	1.0	810	28.1
150	18.5	490	1.3	820	28.7
160	17.5	500	1.8	830	29.3
170	16.5	510	2.3	840	29.8
180	15.5	520	2.8	850	30.3
190	14.5	530	3.4	860	30.7
200	13.5	540	4.0	870	31.0
210	12.5	550	4.7	880	31.3
220	11.5	560	5.5	890	31.6
230	10.5	570	6.2	900	31.8
240	9.6	580	7.0	910	31.9
250	8.7	590	7.9	920	32.0
260	7.8	600	8.8	930	32.0
270	6.9	610	9.7	940	31.9
280	6.1	620	10.6	950	31.8
290	5.4	630	11.6	960	31.6
300	4.6	640	12.5	970	31.3
310	3.9	650	13.5	980	31.0
320	3.3	660	14.5	990	30.7
330	2.7	670	15.5	1000	30.2
340	2.2				

TABLE XIII. Equation VII.

Argument VII.					
Arg. VII.	Equat. VII. Sec.	Arg. VII.	Equat. VII. Sec.	Arg. VII.	Equat. VII. Sec.
0	10.9	340	24.5	670	2.6
10	11.7	350	24.1	680	2.2
20	12.5	360	23.7	690	1.8
30	13.3	370	23.4	700	1.4
40	14.1	380	22.9	710	1.0
50	14.9	390	22.3	720	0.7
60	15.7	400	21.8	730	0.5
70	16.5	410	21.2	740	0.2
80	17.3	420	20.6	750	0.1
90	18.0	430	19.9	760	0.0
100	18.7	440	19.2	770	0.0
110	19.4	450	18.5	780	0.0
120	20.0	460	18.0	790	0.1
130	20.7	470	17.1	800	0.2
140	21.3	480	16.2	810	0.4
150	21.9	490	15.4	820	0.6
160	22.5	500	14.7	830	0.8
170	23.0	510	13.9	840	1.1
180	23.4	520	13.1	850	1.5
190	23.8	530	12.3	860	1.9
200	24.2	540	11.5	870	2.2
210	24.6	550	10.7	880	2.7
220	24.9	560	9.9	890	3.3
230	25.1	570	9.1	900	3.8
240	25.4	580	8.3	910	4.4
250	25.5	590	7.6	920	5.0
260	25.6	600	6.9	930	5.7
270	25.6	610	6.2	940	6.4
280	25.6	620	5.6	950	7.1
290	25.5	630	4.9	960	7.8
300	25.4	640	4.3	970	8.5
310	25.2	650	3.7	980	9.4
320	25.0	660	3.1	990	10.2
330	24.8	670	2.6	1000	10.9
340	24.5				

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TABLE XIV. Equation VIII.

Argument VIII.					
Arg. VIII.	Equat. VIII.	Arg. VIII.	Equat. VIII.	Arg. VIII.	Equat. VIII.
	Sec.		Sec.		Sec.
0	24.1	340	1.4	670	13.6
10	23.6	350	1.0	680	14.5
20	23.1	360	0.7	690	15.3
30	22.5	370	0.5	700	16.1
40	21.9	380	0.3	710	16.8
50	21.4	390	0.1	720	17.6
60	20.8	400	0.1	730	18.4
70	20.1	410	0.0	740	19.1
80	19.4	420	0.0	750	19.8
90	18.7	430	0.1	760	20.4
100	18.0	440	0.2	770	21.0
110	17.2	450	0.4	780	21.7
120	16.4	460	0.6	790	22.3
130	15.6	470	0.8	800	22.9
140	14.8	480	1.2	810	23.4
150	14.0	490	1.5	820	23.9
160	13.2	500	1.9	830	24.3
170	12.4	510	2.4	840	24.6
180	11.5	520	2.9	850	25.0
190	10.7	530	3.5	860	25.3
200	9.9	540	4.0	870	25.5
210	9.2	550	4.6	880	25.7
220	8.4	560	5.2	890	25.9
230	7.6	570	5.9	900	25.9
240	6.9	580	6.6	910	26.0
250	6.2	590	7.3	920	26.0
260	5.6	600	8.0	930	25.9
270	5.0	610	8.8	940	25.8
280	4.3	620	9.6	950	25.6
290	3.7	630	10.4	960	25.5
300	3.1	640	11.2	970	25.2
310	2.6	650	12.0	980	24.8
320	2.1	660	12.8	990	24.5
330	1.7	670	13.6	1000	24.1
340	1.4				

TABLE XV. Equation IX.

Argument IX.					
Arg. IX.	Equat. IX.	Arg. IX.	Equat. IX.	Arg. IX.	Equat. IX.
	Sec.		Sec.		Sec.
0	19.8	340	14.1	670	0.5
10	20.3	350	13.4	680	0.8
20	20.8	360	12.7	690	1.0
30	21.2	370	12.0	700	1.3
40	21.5	380	11.2	710	1.7
50	21.9	390	10.5	720	2.0
60	22.2	400	9.8	730	2.4
70	22.5	410	9.1	740	2.9
80	22.8	420	8.4	750	3.4
90	23.0	430	7.7	760	3.9
100	23.1	440	7.0	770	4.5
110	23.1	450	6.3	780	5.0
120	23.2	460	5.6	790	5.6
130	23.2	470	5.0	800	6.3
140	23.1	480	4.5	810	7.0
150	23.1	490	3.9	820	7.7
160	23.0	500	3.4	830	8.4
170	22.7	510	2.9	840	9.1
180	22.4	520	2.4	850	9.8
190	22.2	530	2.0	860	10.5
200	21.9	540	1.7	870	11.2
210	21.5	550	1.3	880	12.0
220	21.2	560	1.0	890	12.7
230	20.8	570	0.8	900	13.4
240	20.3	580	0.4	910	14.1
250	19.8	590	0.2	920	14.8
260	19.3	600	0.1	930	15.5
270	18.7	610	0.1	940	16.2
280	18.2	620	0.0	950	16.9
290	17.6	630	0.0	960	17.6
300	16.9	640	0.1	970	18.2
310	16.2	650	0.1	980	18.7
320	15.5	660	0.2	990	19.3
330	14.8	670	0.5	1000	19.8
340	14.1				

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TABLE XVI. Equation X.

Argument X. = VII. - VIII.					
Arg. X.	Equat. X. Sec.	Arg. X.	Equat. X. Sec.	Arg. X.	Equat. X. Sec.
0	17.1	340	12.2	670	0.4
10	17.5	350	11.6	680	0.7
20	17.9	360	10.9	690	0.9
30	18.3	370	10.3	700	1.1
40	18.6	380	9.7	710	1.4
50	18.9	390	9.1	720	1.8
60	19.1	400	8.4	730	2.1
70	19.4	410	7.8	740	2.5
80	19.6	420	7.2	750	2.9
90	19.8	430	6.6	760	3.3
100	19.9	440	6.1	770	3.8
110	19.9	450	5.5	780	4.4
120	20.0	460	4.9	790	4.9
130	20.0	470	4.4	800	5.5
140	20.0	480	3.8	810	6.0
150	19.9	490	3.3	820	6.6
160	19.8	500	2.9	830	7.2
170	19.6	510	2.5	840	7.8
180	19.3	520	2.1	850	8.4
190	19.1	530	1.7	860	9.1
200	18.9	540	1.4	870	9.7
210	18.6	550	1.1	880	10.3
220	18.2	560	0.9	890	10.9
230	17.9	570	0.6	900	11.6
240	17.5	580	0.4	910	12.2
250	17.1	590	0.2	920	12.8
260	16.7	600	0.1	930	13.4
270	16.2	610	0.1	940	13.9
280	15.6	620	0.0	950	14.5
290	15.1	630	0.0	960	15.1
300	14.5	640	0.0	970	15.6
310	14.0	650	0.1	980	16.2
320	13.4	660	0.2	990	16.7
330	12.8	670	0.4	1000	17.1
340	12.2				

TABLE XVII. Equation XI.

Argument XI. = VII. + VIII.					
Arg. XI.	Equat. XI. Sec.	Arg. XI.	Equat. XI. Sec.	Arg. XI.	Equat. XI. Sec.
0	3.9	340	1.8	670	10.7
10	3.5	350	2.1	680	10.8
20	3.2	360	2.4	690	10.8
30	3.0	370	2.7	700	10.8
40	2.7	380	3.0	710	10.8
50	2.4	390	3.3	720	10.8
60	2.1	400	3.6	730	10.7
70	1.8	410	3.9	740	10.7
80	1.6	420	4.2	750	10.6
90	1.3	430	4.6	760	10.6
100	1.1	440	4.9	770	10.4
110	0.9	450	5.2	780	10.2
120	0.8	460	5.6	790	10.0
130	0.6	470	5.9	800	9.9
140	0.4	480	6.2	810	9.7
150	0.3	490	6.6	820	9.5
160	0.2	500	6.9	830	9.2
170	0.1	510	7.3	840	9.0
180	0.0	520	7.6	850	8.7
190	0.0	530	7.8	860	8.4
200	0.0	540	8.1	870	8.1
210	0.0	550	8.4	880	7.8
220	0.0	560	8.7	890	7.6
230	0.1	570	9.0	900	7.2
240	0.1	580	9.2	910	6.9
250	0.2	590	9.5	920	6.6
260	0.3	600	9.7	930	6.2
270	0.4	610	9.9	940	5.9
280	0.6	620	10.0	950	5.6
290	0.8	630	10.2	960	5.2
300	0.9	640	10.4	970	4.9
310	1.1	650	10.5	980	4.6
320	1.3	660	10.6	990	4.2
330	1.6	670	10.7	1000	3.9
340	1.8				

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TABLE XVIII. Radius Vector of Jupiter's Orbit for 1750, with the Secular Variation.

Argument I. The mean Anomaly of Jupiter.										
Degrees.	Sig. O.			Sig. I.			Sig. II.			Degrees.
	Rad. Vect.	Diff.	Secular Variation.	Rad. Vect.	Diff.	Secular Variation.	Rad. Vect.	Diff.	Secular Variation.	
			+ 0.000			+ 0.000			+ 0.000	
0	5.44648		69.64	5.41579		61.99	5.33011		39.86	30
1	5.44645	3	69.63	5.41375	204	61.49	5.32649	362	38.90	29
2	5.44634	11	69.61	5.41165	210	60.95	5.32283	366	37.93	28
3	5.44617	17	69.57	5.40949	216	60.41	5.31914	369	36.95	27
		24			223			374		
4	5.44593		69.51	5.40726		59.83	5.31540		35.96	26
5	5.44561	32	69.43	5.40498	228	59.25	5.31163	377	34.95	25
6	5.44523	38	69.34	5.40263	235	58.65	5.30782	381	33.93	24
		45			240			384		
7	5.44478		69.22	5.40023		58.05	5.30398		32.90	23
8	5.44426	52	69.09	5.39776	247	57.43	5.30010	388	31.85	22
9	5.44368	58	68.95	5.39524	252	56.78	5.29619	391	30.81	21
		66			257			394		
10	5.44302		68.79	5.39267		56.12	5.29225		29.75	20
11	5.44229	73	68.61	5.39003	264	55.44	5.28827	398	28.68	19
12	5.44150	79	68.40	5.38734	269	54.77	5.28427	400	27.60	18
		86			275			404		
13	5.44064		68.19	5.38459		54.06	5.28023		26.50	17
14	5.43971	93	67.98	5.38179	280	53.33	5.27617	406	25.40	16
15	5.43871	100	67.74	5.37893	286	52.60	5.27209	408	24.29	15
		107			291			412		
16	5.43764		67.45	5.37602		51.85	5.26797		23.17	14
17	5.43651	113	67.18	5.37306	296	51.09	5.26383	414	22.05	13
18	5.43531	120	66.87	5.37005	301	50.31	5.25967	416	20.92	12
		126			307			418		
19	5.43405		66.56	5.36698		49.52	5.25549		19.76	11
20	5.43271	134	66.23	5.36387	311	48.70	5.25128	421	18.60	10
21	5.43131	140	65.88	5.36070	317	47.88	5.24706	422	17.44	9
		146			321			424		
22	5.42985		65.52	5.35749		47.05	5.24282		16.27	8
23	5.42832	153	65.13	5.35422	327	46.20	5.23856	426	15.11	7
24	5.42672	160	64.74	5.35091	331	45.33	5.23428	428	13.92	6
		166			335			429		
25	5.42506		64.32	5.34756		44.45	5.22999		12.73	5
26	5.42333	173	63.88	5.34416	340	43.56	5.22569	430	11.54	4
27	5.42154	179	63.44	5.34071	345	42.65	5.22137	432	10.34	3
		185			349			433		
28	5.41969		62.98	5.33722		41.73	5.21704		9.14	2
29	5.41777	192	62.49	5.33368	354	40.79	5.21270	434	7.93	1
30	5.41579	198	61.99	5.33011	357	39.86	5.20836	434	6.72	0
	Sig. XI.		+	Sig. X.		+	Sig. IX.		+	

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TABLE XVIII. Radius Vector of Jupiter's Orbit for 1750, with the Secular Variation.

Argument I. The mean Anomaly of Jupiter.										
Degrees.	Sig. III.			Sig. IV.			Sig. V.			Degrees.
	Rad. Vect.	Diff.	Secular Variation.	Rad. Vect.	Diff.	Secular Variation.	Rad. Vect.	Diff.	Secular Variation.	
			+ 0.000			— 0.000			— 0.000	
0	5.20836		06.72	5.08063		29.78	4.98293		58.63	30
1	5.20400	436	05.49	5.07669	394	30.93	4.98059	234	59.33	29
2	5.19964	436	04.28	5.07278	391	32.07	4.97832	227	60.02	28
3	5.19528	436	03.06	5.06891	387	33.20	4.97612	220	60.67	27
		437			383			212		
4	5.19091		01.82	5.06508		34.32	4.97400		61.30	26
5	5.18654	437	00.61	5.06128	380	35.43	4.97195	205	61.92	25
6	5.18217	437	00.64	5.05753	375	36.53	4.96997	198	62.50	24
		437			371			191		
7	5.17780		01.87	5.05382		37.62	4.96806		63.07	23
8	5.17343	437	03.09	5.05016	366	38.70	4.96624	182	63.62	22
9	5.16907	436	04.34	5.04653	363	39.76	4.96448	176	64.14	21
		436			357			167		
10	5.16471		05.58	5.04296		40.82	4.96281		64.65	20
11	5.16035	436	06.82	5.03943	353	41.86	4.96121	160	65.14	19
12	5.15601	434	08.06	5.03595	348	42.89	4.95969	152	65.59	18
		434			343			144		
13	5.15167		09.29	5.03252		43.91	4.95825		66.02	17
14	5.14734	433	10.53	5.02914	338	44.89	4.95689	136	66.43	16
15	5.14303	431	11.75	5.02581	333	45.88	4.95560	129	66.82	15
		431			328			120		
16	5.13872		12.98	5.02253		46.85	4.95440		67.18	14
17	5.13444	428	14.22	5.01931	322	47.80	4.95328	112	67.51	13
18	5.13016	428	15.44	5.01615	316	48.75	4.95224	104	67.82	12
		425			311			96		
19	5.12591		16.66	5.01304		49.66	4.95128		68.11	11
20	5.12167	424	17.89	5.00999	305	50.56	4.95040	88	68.37	10
21	5.11745	422	19.11	5.00700	299	51.46	4.94961	79	68.61	9
		419			293			71		
22	5.11326		20.31	5.00407		52.33	4.94890		68.83	8
23	5.10908	418	21.52	5.00120	287	53.19	4.94827	63	69.02	7
24	5.10493	415	22.73	4.99839	281	54.02	4.94773	54	69.18	6
		412			274			46		
25	5.10081		23.91	4.99565		54.83	4.94727		69.32	5
26	5.09672	409	25.10	4.99298	267	55.63	4.94689	38	69.43	4
27	5.09265	407	26.28	4.99036	262	56.41	4.94659	30	69.51	3
		404			254			21		
28	5.08861		27.45	4.98782		57.17	4.94638		69.58	2
29	5.08460	401	28.62	4.98534	248	57.91	4.94626	12	69.62	1
30	5.08063	397	29.78	4.98293	241	58.63	4.94622	4	69.64	0
	Sig. VIII.		—	Sig. VII.		—	Sig. VI.		—	

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TABLE XIX.

Equations of the Radius Vector,
always additive.

Arg. II.	Equation II	Diff.	Arg. II.
	00.0		
0	075	3	10000
100	078	9	9900
200	087	14	9800
300	101	19	9700
400	120	25	9600
500	145	28	9500
600	173	32	9400
700	205	35	9300
800	240	37	9200
900	277	39	9100
1000	316	39	9000
1100	355	38	8900
1200	393	37	8800
1300	430	36	8700
1400	466	33	8600
1500	499	30	8500
1600	529	27	8400
1700	556	23	8300
1800	579	19	8200
1900	598	14	8100
2000	612	10	8000
2100	622	5	7900
2200	627	1	7800
2300	628	4	7700
2400	624	7	7600
2500	617	12	7500
2600	605	16	7400
2700	589	20	7300
2800	569	22	7200
2900	547	26	7100
3000	521	28	7000
3100	493	30	6900
3200	463	32	6800
3300	431	34	6700
3400	397	35	6600
3500	362	35	6500
3600	327	35	6400
3700	292	35	6300
3800	256	35	6200
3900	221	33	6100
4000	188	32	6000
4100	156	30	5900
4200	126	28	5800
4300	98	25	5700
4400	67	21	5600
4500	37	18	5500
4600	8	14	5400
4700	0	11	5300
4800	009	7	5200
4900	002	2	5100
5000	000		5000

TABLE XX.

Equations of the Radius Vector, always
additive.

Arg. IV.	Equation IV.	Diff.	Arg. IV.	Equation IV.	Diff.
	0.00			0.00	
0	049	5	5000	136	5
100	044	5	5100	141	5
200	039	4	5200	146	5
300	035	5	5300	151	4
400	030	4	5400	155	4
500	026	4	5500	159	4
600	022	4	5600	163	4
700	018	3	5700	167	4
800	015	3	5800	170	3
900	012	3	5900	173	3
1000	009	2	6000	176	3
1100	007	2	6100	178	2
1200	005	2	6200	180	2
1300	003	1	6300	182	2
1400	002	1	6400	183	1
1500	001	0	6500	184	1
1600	000	0	6600	185	1
1700	000	0	6700	185	0
1800	000	1	6800	185	0
1900	001	1	6900	185	1
2000	002	1	7000	184	1
2100	003	1	7100	183	2
2200	004	2	7200	181	2
2300	006	2	7300	179	2
2400	008	3	7400	177	2
2500	011	3	7500	175	3
2600	014	3	7600	172	4
2700	017	3	7700	168	4
2800	020	4	7800	165	4
2900	024	4	7900	161	4
3000	028	5	8000	157	4
3100	033	5	8100	153	5
3200	037	5	8200	148	5
3300	042	5	8300	143	5
3400	047	5	8400	138	5
3500	052	5	8500	133	5
3600	057	6	8600	128	5
3700	063	6	8700	123	6
3800	068	6	8800	117	6
3900	074	6	8900	111	6
4000	080	6	9000	106	6
4100	086	6	9100	100	6
4200	091	6	9200	94	6
4300	097	6	9300	88	6
4400	103	6	9400	82	5
4500	109	6	9500	77	6
4600	115	5	9600	71	6
4700	120	5	9700	65	5
4800	126	5	9800	60	6
4900	131	5	9900	54	6
5000	136	5	10000	49	5

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TABLE XXI.

Equations of the Radius Vector, always additive.

Arg. V.	Equation V.		Arg. V.	Equation V.		Arg. V.	Equation V.		Arg. V.	Equation V.	
	0.00	Diff.		0.00	Diff.		0.00	Diff.		0.00	Diff.
0	087	11	2500	381	7	5000	334	11	7500	040	7
100	098	11	2600	388	7	5100	323	11	7600	033	7
200	109		2700	395		5200	312		7700	026	
		12			6			12			6
300	121	13	2800	401	5	5300	300	12	7800	020	5
400	134	12	2900	406	5	5400	288	13	7900	015	5
500	146		3000	411		5500	275		8000	010	
		13			4			13			4
600	159	13	3100	415	2	5600	262	13	8100	006	2
700	172	13	3200	417	2	5700	249	13	8200	004	2
800	185		3300	419		5800	236		8300	002	
		13			2			13			2
900	198	13	3400	421	0	5900	223	13	8400	000	0
1000	211	13	3500	421	1	6000	210	13	8500	000	0
1100	224		3600	420		6100	197		8600	001	1
		13			1			13			1
1200	237	13	3700	419	2	6200	184	13	8700	002	2
1300	250	13	3800	417	3	6300	171	13	8800	004	3
1400	263		3900	414		6400	158		8900	007	
		13			3			13			3
1500	276	12	4000	411	5	6500	145	13	9000	010	5
1600	288	13	4100	406	5	6600	132	12	9100	015	5
1700	301		4200	401		6700	120		9200	020	
		11			6			11			6
1800	312	12	3300	395	7	6800	109	12	9300	026	7
1900	324	11	4400	388	8	6900	097	11	9400	033	8
2000	335	10	4500	380	8	7000	086	10	9500	041	8
2100	345		4600	372		7100	076		9600	049	
		10			8			10			8
2200	355	9	4700	364	10	7200	066	9	9700	057	10
2300	364	9	4800	354	10	7300	057	9	9800	067	10
2400	373	8	4900	344	10	7400	048	8	9900	077	10
2500	381		5000	334		7500	040		10000	087	

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TABLE XXII. Heliocentric Latitude for 1750, with the Secular Variation.

Argument XII. Longitude of Jupiter — that of the Node.

Degrees.	Latitude.			Differ.	Sec. Var.	Latitude.			Differ.	Sec. Var.	Latitude.			Differ.	Sec. Var.	Degrees.
	Sig. O. N.					Sig. I. N.					Sig. II. N.					
	Sig. VI. S.					Sig. VII. S.					Sig. VIII. S.					
	D	M.	S.			D	M.	S.			D	M.	S.			
0	0	0	0	1 23	0.0	0	39	31	1 11	11.0	1	8	27	40	19.0	30
1	0	1	23	1 22	0.4	0	40	42	1 11	11.4	1	9	7	40	19.2	29
2	0	2	45	1 23	0.8	0	41	53	1 10	11.7	1	9	47	38	19.4	28
3	0	4	8	1 23	1.1	0	43	3	1 9	12.0	1	10	25	37	19.6	27
4	0	5	31	1 22	1.5	0	44	12	1 8	12.3	1	11	2	36	19.8	26
5	0	6	53	1 23	1.9	0	45	20	1 7	12.6	1	11	38	34	20.0	25
6	0	8	16	1 22	2.3	0	46	27	1 7	12.9	1	12	12	33	20.1	24
7	0	9	38	1 22	2.7	0	47	34	1 5	13.2	1	12	45	32	20.3	23
8	0	11	0	1 22	3.1	0	48	39	1 5	13.5	1	13	17	30	20.4	22
9	0	12	22	1 21	3.4	0	49	44	1 4	13.8	1	13	47	29	20.5	21
10	0	13	43	1 22	3.8	0	50	48	1 3	14.1	1	14	16	28	20.7	20
11	0	15	5	1 21	4.2	0	51	51	1 2	14.4	1	14	44	26	20.8	19
12	0	16	26	1 21	4.6	0	52	53	1 1	14.7	1	15	10	25	20.9	18
13	0	17	47	1 20	5.0	0	53	54	1 0	15.0	1	15	35	23	21.1	17
14	0	19	7	1 20	5.4	0	54	54	0 59	15.3	1	15	58	22	21.2	16
15	0	20	27	1 20	5.7	0	55	53	0 58	15.5	1	16	20	21	21.3	15
16	0	21	47	1 19	6.1	0	56	51	0 57	15.8	1	16	41	19	21.4	14
17	0	23	6	1 19	6.5	0	57	48	0 56	16.1	1	17	0	18	21.5	13
18	0	24	25	1 19	6.8	0	58	44	0 55	16.3	1	17	18	17	21.5	12
19	0	25	44	1 18	7.2	0	59	39	0 54	16.6	1	17	35	15	21.6	11
20	0	27	2	1 17	7.6	1	0	33	0 52	16.9	1	17	50	14	21.6	10
21	0	28	19	1 17	7.9	1	1	25	0 52	17.1	1	18	4	12	21.7	9
22	0	29	36	1 17	8.3	1	2	17	0 50	17.4	1	18	16	11	21.8	8
23	0	30	53	1 16	8.7	1	3	7	0 49	17.6	1	18	27	9	21.8	7
24	0	32	9	1 15	9.0	1	3	56	0 48	17.8	1	18	36	8	21.9	6
25	0	33	24	1 15	9.4	1	4	44	0 47	18.1	1	18	44	7	21.9	5
26	0	34	39	1 14	9.7	1	5	31	0 45	18.3	1	18	51	5	22.0	4
27	0	35	53	1 13	10.0	1	6	16	0 45	18.5	1	18	56	3	22.0	3
28	0	37	6	1 13	10.4	1	7	1	0 44	18.7	1	18	59	2	22.0	2
29	0	38	19	1 12	10.7	1	7	45	0 42	18.9	1	19	1	1	22.0	1
30	0	39	31		11.0	1	8	27		19.0	1	19	2	1	22.0	0
	Sig. XI. S				—	Sig. X. S.				—	Sig. IX. S.				—	
	Sig. V. N.					Sig. IV. N.				—	Sig. III. N.				—	

For any time before 1750, the Secular Variation changes the Sign.

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TABLE XXIII. Reduction to the Ecliptic, and the Logarithm of the Cosine of the Heliocentric Latitude.

Argument XII.							
Degrees.	Reduction to Ecliptic.	Log. cosin. Lat. helioc.	Reduction to Ecliptic.	Log. cosin. Lat. helioc.	Reduction to Ecliptic.	Log. cosin. Lat. helioc.	Degrees.
	Sig. O. —		Sig. I. —		Sig. II. —		
	Sig. VI. —		Sig. VII. —		Sig. VIII. —		
	Sec.		Sec.		Sec.		
0	0.0	0.000000	23.6	9.999971	23.6	9.999914	30
1	0.9	0.000000	24.0	9.999970	23.1	9.999912	29
2	1.9	0.000000	24.5	9.999968	22.6	9.999910	28
3	2.8	0.000000	24.9	9.999966	22.1	9.999909	27
4	3.8	9.999999	25.3	9.999964	21.5	9.999907	26
5	4.7	9.999999	25.6	9.999962	20.9	9.999906	25
6	5.7	9.999999	25.9	9.999960	20.3	9.999904	24
7	6.6	9.999998	26.2	9.999958	19.6	9.999903	23
8	7.5	9.999998	26.4	9.999957	19.0	9.999901	22
9	8.4	9.999997	26.7	9.999955	18.2	9.999900	21
10	9.3	9.999997	26.8	9.999953	17.5	9.999899	20
11	10.2	9.999996	27.0	9.999951	16.8	9.999897	19
12	11.1	9.999995	27.1	9.999949	16.0	9.999896	18
13	12.0	9.999994	27.2	9.999947	15.2	9.999895	17
14	12.8	9.999993	27.2	9.999945	14.4	9.999895	16
15	13.6	9.999992	27.2	9.999943	13.6	9.999893	15
16	14.4	9.999991	27.2	9.999941	12.8	9.999892	14
17	15.2	9.999990	27.2	9.999939	12.0	9.999891	13
18	16.0	9.999989	27.1	9.999937	11.1	9.999890	12
19	16.8	9.999988	27.0	9.999935	10.2	9.999889	11
20	17.5	9.999987	26.8	9.999933	9.3	9.999889	10
21	18.2	9.999985	26.7	9.999931	8.4	9.999888	9
22	19.0	9.999984	26.4	9.999929	7.5	9.999887	8
23	19.6	9.999982	26.2	9.999927	6.6	9.999887	7
24	20.3	9.999981	25.9	9.999925	5.7	9.999887	6
25	20.9	9.999980	25.6	9.999923	4.7	9.999886	5
26	21.5	9.999978	25.3	9.999921	3.8	9.999886	4
27	22.1	9.999976	24.9	9.999919	2.8	9.999886	3
28	22.6	9.999974	24.5	9.999917	1.9	9.999885	2
29	23.1	9.999973	24.0	9.999916	0.9	9.999885	1
30	23.6	9.999971	23.6	9.999914	0.0	9.999885	0
	Sig. XI. +		Sig. X. +		Sig. IX. +		
	Sig. V. +		Sig. IV. +		Sig. III. +		

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Explanation of the Tables of Jupiter.

The first Table contains the epochs of the mean longitude of the aphelion and node of Jupiter; together with the Arguments of the equations expressed by dividing the circle into 10,000 equal parts for Arguments II, III, IV, V; and into 1000 equal parts for Arguments VI, VII, VIII, IX. Table II. contains the mean motions of the same for years. Table III. contains the mean motions for months; that is, for the beginning of each month reckoned from the beginning of the year. Table IV. contains the mean motions for days. Table V. contains the mean motions for hours and minutes. Table VI. contains the great equation of Jupiter for every 10 years. Table VII. contains the equation of Jupiter's orbit for the year 1750, with the secular variation. Table VIII. contains the equation of the orbit corresponding to Argument II. Table IX. contains the equation answering to Argument III. Table X. contains the equation answering to Argument IV. Table XI. contains the equation answering to Argument V. Table XII. contains the equation answering to Argument VI. Table XIII. contains the equation answering to Argument VII. Table XIV. contains the equation answering to Argument VIII. Table XV. contains the equation answering to Argument IX. Table XVI. contains the equation answering to Argument VII. — Argument VIII. Table XVII. contains the equation answering to Argument VII. + Argument VIII. Table XVIII. contains the radius vector of the orbit of Jupiter for 1750, with the secular variation; the mean distance of the earth from the sun being unity. Table XIX. contains the equation of the radius vector answering to Argument II. Table XX. contains the equation answering to Argument IV. Table XXI. contains the equation answering to Argument V. Table XXII. contains the heliocentric latitude of Jupiter for the year 1750, with the secular variation. Table XXIII. contains the reduction to the ecliptic; with the log. cosine of the heliocentric latitude.

All the above mentioned equations of the motion of Jupiter, the equations of the orbit excepted, arise from the attraction of Saturn, and depend upon the relative situation of Jupiter and Saturn. The theory of these equations was given by M. de la Place in the Memoirs of 1786, from the theory of gravity, and they were computed by M. de Lambre.

Let a express the number of years from 1750, S the mean longitude of Saturn, I the mean longitude of Jupiter: then the great equation of Jupiter is,

$$-(20' 49''.5 - a \times 0''.042733) \times \sin. (5S - 2I + 5^\circ 34' 8'' - a \times 58''.88).$$

The great equation of Saturn arising from the attraction of Jupiter, is also found to be (Mem. 1785),

$$-(48' 44'' - a \times 0''.1) \times \sin. (5S - 2I + 5^\circ 34' 8'' - a \times 58''.88).$$

The period of these two equations is 918.76 years. By way of distinction, these are called the *great* equations of Jupiter and Saturn: these two equations of Jupiter and Saturn are very nearly in the ratio of 3 to 7. Now it is manifest, that when $5S - 2I - a \times 58''.88 = 360^\circ$, the equation must then begin again, and therefore this will determine the period; now $5S - 2I - a \times 58''.88$ increases $1410''.6$ in a common year; therefore $\frac{360^\circ \times 60 \times 60}{1410.6} = 918.76$ years, the period in which these equations return again the same.

These equations shew the reason, why the present mean

motions of Jupiter and Saturn differ from the true mean motions, as the latter cannot be determined but by taking in the above period. We have the apparent mean motion of Saturn, in a common year, by adding to its mean annual motion, the quantity by which the great equation varies in that time, and this quantity is very nearly $-(48' 44'' - a \times 0''.1) \times \sin. 23' 31'' \times \cos. (5S - 2I + 5^\circ 34' 8'' - a \times 58''.88)$; and the apparent mean motion of Jupiter is this quantity with a contrary sign, diminished in the ratio of 7 to 3, and added to his mean annual motion.

Now the fluxion of the cosine of any quantity = sine \times flux. arc, therefore when $\cos. =$ a maximum, sine \times flux. arc = 0, or the sine of the arc = 0, or the arc = 0; therefore when the above quantity = a maximum, $5S - 2I + 5^\circ 34' 8'' - a \times 58''.88 = 0$, which happened in the year 1560. At that time, the apparent annual motion of Saturn was less than the true, by $20''.1$, and that of Jupiter greater by $8''.6$; since that time their apparent mean motions have been approaching to their true mean motions, and in 1789 their apparent and true mean motions were equal. These results shew, why, in comparing the modern with the ancient observations, the mean motion of Saturn appears to be retarded, and that of Jupiter accelerated; and that from a comparison of the modern observations, the mean motion of Saturn appears to be accelerated, and that of Jupiter to be retarded.

Now if H be the heliocentric mean longitude of Jupiter; b that of Saturn, corrected by the above equations respectively, computed from the equinox of the year 1750; the other equations of the motion of Jupiter from the action of Saturn, are,

$$\begin{aligned} &- 1' 22'.7 \sin. (H - b) + 3' 24'.3 \sin. 2(H - b) + 17'' \sin. 3(H - b) + 3''.9 \sin. 4(H - b) \\ &+ 2' 18'.4 \sin. (H - 2b - 13' 33' 7'' + a \times 13''.7) \\ &+ 1' 27'.4 \sin. (2H - 3b - 61' 59' 48'' + a \times 21.9) \\ &+ 2' 47'.0 \sin. (3H - 5b + 55' 19' 21'' + a \times 43.0) \\ &- 16.0 \sin. (3H - 4b - 62' 51' 19'') \\ &+ 12.8 \sin. (3H - 2b - 8' 30' 15'') \\ &- 13.0 \sin. (3b - H - 58' 31' 0'') \\ &+ 11.6 \sin. (b + 45' 4'') \\ &+ 10.0 \sin. (4H - 5b + 45' 16' 32'') \\ &- 5.4 \sin. (2H - b + 16' 1' 27'') \end{aligned}$$

Now the sum of the maxima of all these equations, is $11' 56''.3$; and in the Tables computed for these equations, each equation is increased by its maximum, in order to render all the equations additive; this quantity, therefore, must always be subtracted from the sum of the equations taken from the Tables.

To find the heliocentric Latitude and Longitude of Jupiter.

From Table I. of the epochs, take out the epochs of the mean longitude of the aphelion and node, with the Arguments II, III, IV, V, VI, VII, VIII, IX, and place them in an horizontal line. But if the given year be not found in that Table, take the nearest year preceding the given year as an epoch, and take out as before; under which, from Table II, place the mean motion in longitude, of the aphelion and node, with the Arguments, answering to the number of years elapsed since the epoch to the given year.

Under these, write down (Table III.) the mean motions of the same, for the given month.

Under these, write down (Table IV.) the mean motions of the same, for the given day of the month.

Under these, write down (Table V.) the mean motions of the same, for the given hours and minutes. The arguments for hours and minutes are so small that they are here omitted:

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emitted; the mean motions for seconds are also omitted for the same reason. In our computations, therefore, we take to the nearest minute.

Under these, write down the great inequality (Table VI.) in the first column, with the corresponding arguments.

Add together the numbers in the several columns, rejecting 12 S, or any multiple thereof, if they occur; and in the arguments, rejecting 10,000 for Arguments II, III, IV, V, and 1000 for Arguments VI, VII, VIII, IX, or any multiples thereof, and you get, for the given time, the mean longitude corrected for the great equation, the aphelion, the node, and the arguments corrected for the great equation.

From the longitude corrected for the great equation, as already found, subtract the longitude of the aphelion, and you have Arg. I. Arg. VII. — Arg. VIII. gives Arg. X.; Arg. VI. + Arg. VIII. gives Arg. XI.

With Argument I. making proportion for the minutes and seconds, take out the equation of Jupiter's orbit in Table VII., together with the secular variation, with their proper signs, except the time be *before* 1750, in which case, the secular variation is to be taken out with a contrary sign; then say, 100 : the years from 1750 to the given time :: the secular variation above found : the secular variation required. With Argument II. take out the equation in Table VIII, making proportion in this, and in the following equations, for the intermediate numbers of the arguments. With Argument III. take out the equation in Table IX. With Argument IV. take out the equation in Table X. With Argument V. take out the equation in Table XI.

With Argument VI. take out the equation in Table XII. With Argument VII. take out the equation in Table XIII. With Argument VIII. take out the equation in Table XIV. With Argument IX. take out the equation in Table XV. With Argument X. take out the equation in Table XVI. With Argument XI. take out the equation in Table XVII. Take the sum of all these equations (regard being had to the signs of the first equation and the secular variation, the signs of the others being all positive), and from it subtract 11' 56".3, and you have the value of these eleven equations; and this applied, with its proper sign, to the longitude already found as corrected by the great equation, gives the longitude of Jupiter in his orbit.

From the longitude thus found, subtract the longitude of the node, and you get Argument XII.

With Argument XII. enter Table XXIII. and take out the reduction to the ecliptic with its proper sign, making proportion for the minutes and seconds of the argument; and this applied to the longitude of Jupiter in his orbit, gives his true heliocentric longitude on the ecliptic, reckoned from the mean equinox.

With the Argument XII. enter Table XXII.; take out the latitude with its secular variation, making proportion for the minutes and seconds of the argument; and apply the secular variation, according to its sign, to the latitude, and you have the true heliocentric latitude of Jupiter.

With the mean anomaly of Jupiter, enter Table XVIII. and take out the radius vector, and correct it by the following Tables, and you have the true distance of Jupiter from the sun; the earth's distance being unity.

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Example. — To find the true heliocentric Latitude and Longitude of Jupiter, on July 11, 1780, at 5^h 49' mean Time at Greenwich.

	Longitude.	Aphelion.	Node.	Arguments.								
Epoch for 1780	^s ^o ['] ["] 6 14 38 16.6	^s ^o ['] ["] 6 10 49 26	^s ^o ['] ["] 3 8 12 13	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	
July - - -	15 2 47.0	28	18	8783	2177	0959	3140	974	296	444	661	
11 ^d - - -	54 51.9	2	1	250	81	331	412	58	91	9	17	
5 ^h - - -	1 2.3			15	5	20	25	4	6	1	1	
49' - - -	10.0											
Great equation -	20 46.1			32	55	87	141	12	7	-8	-2	
Sum - - -	7 0 57 53.9	6 10 49 56	3 8 12 32	9080	2318	1397	3718	48	400	446	677	
Sum of 11 equats.	- 1 48 57.8	7 0 57 54	6 29 8 56						446	48		
Long. in orbit -	6 29 8 56.1	0 20 7 58	3 20 56 24	Arg. X. 954								494 Arg. XI
Rcd. to ecl. -	+ 18.2	Arg. I.	Arg. XII.									
Helio. long. -	6 29 9 14.3											

Latitude heliocentric (by Arg. XII.)	1° 13' 49" N.
Secular variation	- 6
True heliocentric latitude	1 13 43 N.

Arg. I.	-	-	-	0 1 47 40.0
Secular variation	-	-	-	- 5.2
Maxima of the next equations	-	-	-	11 56.3
Sum of the negative parts	-	-	-	1 59 41.5
Arg. II.	-	-	-	+ 0 1 33.6
Arg. III.	-	-	-	4 28.4
Arg. IV.	-	-	-	1 9.7
Arg. V.	-	-	-	2 20.3
Arg. VI.	-	-	-	27.4
Arg. VII.	-	-	-	21.8
Arg. VIII.	-	-	-	0.3
Arg. IX.	-	-	-	0.7
Arg. X.	-	-	-	14.8
Arg. XI.	-	-	-	0.7
Sum of the positive parts	+	+	+	0 10 43.7
Value of 11 equations	-	-	-	1 48 57.8

Argument I. and the secular variation being negative, they are added to 11' 56".3 to get the negative parts; but if the two first taken together had been positive, they would have been put above Argument II. amongst the positive equations, and then all the positive equations might have been added up, and 11' 56".3 subtracted from the sum.

This is the true heliocentric longitude on the ecliptic, from the *mean* equinox; and if we want it from the *true* equinox, we must apply to it the equation of the equinoxes.

In this operation, the first five lines are taken out immediately from the Tables. The great equation is thus found: for the beginning of 1780 it is 20' 46", as found immediately in the Table. The great equation for a very distant period is thus found: the variation is expressed by $-a \times 0''.042733 \times \sin. (5 S - 2 I + 5^\circ 34' 8'' - a \times 58''.88)$; if we take $a = 459.38$, which is half a period, $a \times 0''.042733 = 19''.6$, which is additive *before* 1750; this then is the greatest variation of the equation, taking $5 S -$

$2 I + 5^\circ 34' 8'' - a \times 58''.88 = 90^\circ$, so that its sine may $= 1$, a maximum; that is, it is the variation answering to the present greatest equation 20' 49".5, for this is the greatest equation when $a = 0$, or for 1750, and therefore will be very nearly so for the present time. Now suppose we wanted to know the equation for May 16, in the year 133, or in the year 133.37; then we multiply a half period by such a number, that the product added to 133 may produce some year in our Table VI., and then we find the equation for that year; multiply therefore 459.38 by 4, and add it to 133, and it gives 1970, corresponding to which, the equation is 6' 40".2; now the variation of the greatest equation is 19".6 for half a period, and therefore it is $4 \times 19''.6 =$

JUPITER.

78'.4 for 4 half periods; hence, the greatest equation 20' 49'.5 : 6' 40'.2 :: 78'.4 : 26', which (as the time is *before* 1750) added to 6' 40'.2, gives 7' 6".2, the equation for May 16, 133. This, however, is only an approximation. We calculate for half periods, because then all the arguments return again the same. Now from that time to the given time, that is, July 11, 5^h, the interval is 0.53 of a year; and for 10 years, the increase of the equation is 1".7; hence, 10 : 0.53 :: 1".7 : 0".09, the variation in 0.53 of a year; which added to 20' 46', gives 20' 46".09, or 20' 46".1, taking it to the nearest tenth of a second, the great equation. The arguments of the great equation are taken from the year 1780, they not having sensibly altered from that time to the given time. The sums of all the columns give the longitude corrected by the great equation, the aphelion, the node, and the arguments, for the given time. The Arguments I, X, XI, are immediately found according to the rule. The equation to Argument I. is thus found: the Argument is 20' 7' 58". Now in Table VII. the equation answering to 20 is - 1° 46' 59", and the variation for 60' is 5' 9"; hence, 60' : 7' 58" :: 5' 9" : 41", which (as the equation is increasing) added to - 1° 46' 59", gives - 1° 7' 40", the equation required. And to find the secular variation, that variation is - 16".98 for 20^h, and it changes 0".82 for 60'; hence, 60' : 7' 58" :: 0".82 : 0".11, which (as the variation increases) added to - 16".98, gives - 17".09, the secular variation corresponding to the given argument. Now this secular variation is reckoned from 1750, and from thence to July 11, 1780, there has elapsed 30.53 years; hence, 100 : 30.53 :: - 17".09 : - 5".2, the secular variation for 30.53 years. With 9080 take the equation from Table VIII. Now the equation is 1' 30".6 for the Argument 9000, and it changes 3".7 for 100; hence, 100 : 80 :: 3".7 : 3", which (as the equation is increasing) added to 1' 30".6, gives 1' 33".6, the equation required. By proceeding thus to Argument XI. we get all these equations. And by taking the difference of the positive and negative parts, we obtain 1° 48' 57".8, the value of these 11 equations, which applied, with the proper sign, to 7° 0' 57' 53".9, gives 6° 29' 8' 56".1, the longitude of Jupiter in his orbit. Now for the reduction of this to the ecliptic, we have Argument XII. = 3° 20' 56' 24"; and the reduction in Table XXIV. is + 17".5 for 3° 20'; and it changes 0".7 for 60'; hence, 60' : 56' 24" :: 0".7 : 0".7, taking it to the nearest tenth of a second; and this (as the reduction increases) added to + 17".5, gives + 18".2, the reduction, which applied to 6° 29' 8' 56".1, gives 6° 29' 9' 14".3, the true heliocentric longitude of Jupiter in his orbit, from the mean equinox. With Argument XII. enter Table XXIII. and the latitude for 3° 20' is 1° 46' 16" N., and the variation is 29' for 60'; hence, 60' : 56' 24" :: 29' : 27", which (as the equation is diminishing) subtracted from 1° 46' 16" N., gives 1° 13' 49" N., the latitude uncorrected for the secular variation. Now for 3° 20' 56' 24", the secular variation is - 20".5, as we may take it the same as for 3° 21'; and the time from 1750 being 30.53 years, we have, 100 : 30.53 :: - 20".5 : - 6", the secular variation for 30.53 years, and thus applied to 1° 13' 49" N., gives 1° 13' 43" N., the true heliocentric latitude of Jupiter.

Given the heliocentric latitude and longitude of Jupiter; to find the geocentric latitude and longitude, and his distance from the sun and earth.

Example.—To find the geocentric latitude and longitude of

Jupiter, and his distance from the earth, on July 11, 1780, at 5^h 49' mean time.

Hel. long. Jupiter	-	-	-	5	0	1	"	6	29	9	14.3
Longitude earth	-	-	-	-	-	-	-	9	19	52	28.3
Commut.	-	-	-	-	-	-	-	2	20	43	14.0
Sup. (S v E + S E v)	-	-	-	-	-	-	-	3	9	16	46
Half. Sup.	-	-	-	-	-	-	-	1	19	38	23
								1	8	52	16
Elongation	-	-	-	-	-	-	-	2	28	30	39
Long. sun + 20"	-	-	-	-	-	-	-	3	19	52	28.3
Geo. long.	-	-	-	-	-	-	-	6	18	23	7.3
Ar. co. l. fin. 99° 16' 46"	-	-	-	-	-	-	-	-	-	-	0.00577
fin. 18 30 39	-	-	-	-	-	-	-	-	-	-	9.99985
Tan. hel. lat. 1 13 43	-	-	-	-	-	-	-	-	-	-	8.33126
Tan. geo. lat. 1 14 39	-	-	-	-	-	-	-	-	-	-	8.33684
Arg. I.	-	-	-	-	-	-	-	-	-	-	5.43252
Secular variation	-	-	-	-	-	-	-	-	-	-	20
Arg. II.	-	-	-	-	-	-	-	-	-	-	285
IV.	-	-	-	-	-	-	-	-	-	-	2
V.	-	-	-	-	-	-	-	-	-	-	419
Radius vector	-	-	-	-	-	-	-	-	-	-	5.43978
Log. rad. vec.	-	-	-	-	-	-	-	-	-	-	0.7355813
Log. cof. hel. lat.	-	-	-	-	-	-	-	-	-	-	9.9999001
Log. S v	-	-	-	-	-	-	-	-	-	-	0.7354814
Log S v + 10	-	-	-	-	-	-	-	-	-	-	10.7354814
Log. S E	-	-	-	-	-	-	-	-	-	-	0.0071010
Tan. 79° 24' 48" (d)	-	-	-	-	-	-	-	-	-	-	10.7283804
45	-	-	-	-	-	-	-	-	-	-	
Tan. 34 24 48	-	-	-	-	-	-	-	-	-	-	9.8357262
Tan. 49 38 23	-	-	-	-	-	-	-	-	-	-	10.0706464
Tan. 38 52 16	-	-	-	-	-	-	-	-	-	-	9.9063726
Log. S v	-	-	-	-	-	-	-	-	-	-	0.7354814
Log. fin. 80° 44' 14"	-	-	-	-	-	-	-	-	-	-	9.9942791
Ar. co. l. fin. 88 30 39	-	-	-	-	-	-	-	-	-	-	0.0001467
Ar. co. l. cof. 1 14 39	-	-	-	-	-	-	-	-	-	-	0.0001924
Log. E P = 5.3715	-	-	-	-	-	-	-	-	-	-	0.7300996

JUPITER, among *Alchemists*, signifies the philosophers' gold. The gentlemen of this profession apply every thing to their art, which the mythologists mention of the god Jupiter, pretending that the ancient fables are to be understood in a figurative sense: for instance, Jupiter is the master of the gods; and gold, say they, is the most precious of metals. Mercury is the ambassador of Jupiter; and this shews with how much ease Mercury infinuates into every thing. Jupiter holds the thunderbolt as his sceptre; which evidently points out the external sulphur used in projection. Jupiter has the heavens for his ordinary habitation; this shews

shews him volatile, dry, and hot. The debauches of Jupiter, who sought for pleasure in the low, but prolific and fruitful earth, discover, say they, its fecundity, and that gold might be made, were but the way of preparing it discovered. In a word, Jupiter is the son of Saturn, which shews some resemblance between the qualities of gold and lead.

JUPITER, in *Chemistry*, denotes tin.

JUPITER's *Beard*, *Barba Jovis*, in *Botany*, the name given to a species of *anthyllis*.

JUPITER's *Beard*, *American*, is a species of *Amorpha*.

JUPITER's *Dislaff*, is a species of *SALVIA* or sage.

JUPITER *Fulminans* and *Fulgurator*. See *FULMINANT*.

JUPITER, *Flamen* of. See *FLAMEN*.

JUPUBA, in *Ornithology*. See *ORIOLES Hemorrhous*.

JUPUJUBA, the Brazilian name of a bird of the woodpecker kind, more commonly known by the name *Japu*. See *ORIOLES Persicus*.

JUQUER, in *Botany*. This plant is found in Brasil, and is of a poisonous nature; but if we may credit Piso, its root is its antidote.

JURA, in *Geography*, one of the eleven departments of the eastern region of France, composed of the bailliages of Dole and Aval, in 46° 40' N. lat., between Saône and Switzerland. It is bounded on the N. by the department of the Upper Saône, on the E. by the department of the Doubs, and the canton of Berne in Switzerland, on the S. by the department of the Aisne, and on the W. by the departments of the Saône and Loire, and Côte d'Or. The capital is Lons le Saulnier. This department contains 527½ kilometres, or about 256 square leagues, in four districts, 32 cantons, and 728 communes; and 289,865 inhabitants. The districts or circles are Dôle, including 63,581 inhabitants; Poligny, 69,378; Lons-le-Saulnier, 107,478; and St. Claude, 49,128. Its contributions amount to 2,005,226 francs, and its expences to 225,873 fr. 58 cents. The plains in this department produce grain, wine, fruits, and pastures; the hills yield little grain, but abound in pastures and extensive forests. It has mines of copper, lead, iron, salt, coal, with quarries of marble, stone, &c.

JURA, one of the Hebrides, or western islands of Scotland, is situated opposite to the district of Knapdale, in Argyshire, to which county it is politically annexed. Its extent is upwards of thirty miles in length, and, on an average, seven in breadth. Of all the western isles, Jura is the most rugged, being chiefly composed of mountains of vast rocks, apparently piled on each other in the utmost disorder, without a possibility of cultivation. The four principal of these mountains are termed the Paps-of-Jura; which form a ridge from south to north, nearly through the middle of the island. These are conspicuous at a great distance, and terminate the western prospect from the continent; from their situation and height, they are frequently enveloped in clouds and darkness. Of these four, the southern is called Beinn-Achaolais, "the mountain of the sound," from its proximity to the sound of Isla; the next, which is the highest, Beinn-an-oir, "the mountain of gold;" the third, Beinn-sheunta, "the consecrated mountain;" and the northern Corra-bhien, "the steep mountain." Pennant reports that he ascended Beinn-an-oir with great difficulty, and describes it as being composed of large stones, covered with mosses near the base; but all above were bare and unconnected with each other. "The whole," he says, "seems a *cairn*, the work of the sons of Saturn." The grandeur of the prospect from the summit, however, compensated him for the fatigue of the ascent. Jura itself afforded a stupendous scene of rock, varied with innumerable small lakes, and calculated to

raise sublime emotions in the mind of the spectator. From the west side of the hill ran a narrow strip of rock, called *the slide of the old hag*, and terminating in the sea. To the south appeared Ilay, extended like a map; and beyond it, the north of Ireland; to the west, Gigha and Cara, Cantyre and Arran, and the Firth of Clyde, bounded by Ayrshire; an amazing tract of mountains to the north-east, as far as Ben-lomond; Skarba finished the northern view; and over the western ocean were scattered Colonsay and Oransay, Mull, Iona, and the neighbouring group of islands; and still further, the long extents of Tirey and Col just apparent. Sir Joseph Banks and his friends, in their journey to Scotland, ascended Beinn-sheunta, and found it to be 2359 feet above the level of the sea; but Beinn-an-oir exceeds that in height by 61 feet. The west side of the island is not fit for cultivation, being so wild and rugged, and so intersected by torrents rushing from the mountains, that no person chooses to make his abode in it. All the inhabitants, therefore, live on the east side; where, along the margin of the sea, the coast is pretty level; but at a small distance from the shore there is a gradual ascent. The only corn cultivated here is oats and barley; potatoes and flax are also produced: the only manure is the sea-weed, which is cast on shore. Artificial grasses are unknown; and lime cannot be procured by the poor husbandmen. On the east coast of the island are two good harbours: that to the south called the *Small Isles*; the other the *Lowlandman's Bay*: there are also some anchoring places on the western coast. The mountains of Jura abound with several kinds of red deer: and they are also frequented by plenty of grouse and black game. Mr. Pennant mentions his having "some obscure account" of a worm, a native of this island, which, though less pernicious, bears some resemblance to the *Furia infernalis* of Linnæus. There are several barrows and castella in the island; and on the coast, near the harbour of small isles, are the remains of a very considerable encampment. The stones of which the mountains are formed, are of white or red quartz granite; some of which are brecciated, or filled with crystalline kernels of an amethystine colour. Here is great abundance of iron, and a vein of the black oxyd of manganese. The climate of Jura, though necessarily of a very moist character, is considered to be very healthy, and favourable to longevity. When visited by Mr. Pennant in 1772, it contained only about 750 inhabitants; but in 1793 the number was 1387. The parish is supposed to be the largest in Great Britain; and the duty the most troublesome and dangerous; it comprises Jura, Colonsay, Oransay, Skarba, and several little isles, divided by narrow and hazardous sounds; forming an extent of sixty miles; the whole of which is supplied by only one minister and an assistant. Pennant's Voyage to the Hebrides.

JURA Sound, on the western coast of Argyshire in Scotland, is a very wide channel, except at its northern end, which separates Ilay, Jura, Luning, Skarba, and some smaller islands, from the main land of Scotland. The sound of Jura connects with Isla sound, Tarbat west loch, Kilsfied loch, Achafill loch, Crinan loch, and the Crinan canal, Graignies loch, &c. Ghia, Cara, Taxa, Aucharin, Borfill, Mackermores, Craigendive, Rukeel, Shunda, and other small islands, are situated in this capacious sound.

JURA, (*Jurassus*, Lat.; *Juras*, Strabo; *Jou-rag*, i. e. the domain of God or Jupiter, in Celtic), a chain of mountains, descending like a stupendous bulwark, the N.W. side of Switzerland. The Jura runs S.S.W. to N.N.E. from the Vouache in Savoy to the canton of Schaffhausen, nearly parallel with the high chain of the Alps; its width towards N.W. being from about 35 to 45 miles. Its highest ridge

is nearest to the Alps. Ascending from the plains of Switzerland, like the sides of a steep roof, to the height of from two to three thousand feet, (which elevation it preserves nearly for the whole of its length,) it describes an undulated line, here and there diversified by rising hills, which appear from 600 to 1000 feet higher than the rest of the chain; and it is seen gradually to decrease in height towards Burgundy. The most elevated parts of the Jura (according to Messrs. Tralles and Picoté) are, the Dole, 5082 feet above the level of the sea; the Mont Tendre, 5170; and the Reculet (the summit of the Thoiry) 5196 feet.

The Jura not attaining the height of the line of snow, is every spring deprived of its snowy covering; nor are glaciers ever seen on it, and it is only in some deep grottos, such as those behind Nyon, and between the Travers and Bevine valleys, that pillars and slabs of ice are found throughout the year. The pasture-meadows of the Jura are much drier than those of the High Alps; there are, however, in some of its parts (for instance in the canton of Basle) full as beautiful and fertile alpine meadows as there are in the central chains: indeed the same alpine plants are found there which in those districts are seen at the elevation of as much as 500 feet above the level of the sea. The brown bear still inhabits the western desert regions of the Jura, and is remembered to have several times made a descent into the Pays de Vaux.

The whole Jura consists of compact lime-stone, the stratification of which affects various inclinations. Marble, gypsum, petrifications, and iron-ores, are frequently met with almost in every part of it; the finest and scarcest petrifications are found in the department of the Jura, near Orgelet, in a mountain called Perouse. Along the whole of the E. side of the Jura a stratum of iron-shot clay may be followed, which contains the iron-ore called bean-ore, and is wrought in different places. Here and there strata of brown-coal and sources of asphaltum are seen in the valleys of the Jura: they owe their origin to forests swallowed up by those terrible earthquakes, to which the Jura has been subject in past ages. As geologically remarkable may likewise be mentioned the numberless blocks of granite and gneiss, dispersed all along the east side of the Jura, in some parts even to the height of 2400 feet. For a more detailed account, see Dr. Ebel's *Bau der Erde in dem Alpen gebirge*, 1805.

JURATAM—*Affisa cadit in juratam*. See ASSISA.

JURATI. See JURATS.

JURATIS, *Non ponendo in*. See *Non Ponendo*.

JURATORES, *Distringas*. See *Distringas*.

JURATS, JURATI, magistrates in the nature of aldermen, for the government of several corporations.

Thus we meet with the mayor and jurats of Maidstone, Rye, Winchelsea, &c.—So also Jersey has a bailiff and twelve jurats, or sworn assistants, to govern the island.

JURBERG, in *Geography*, a town of Samogitia; 20 miles S.S.W. of Roshennie.

JURBO, a river of South America, which runs into the gulf of Darien. N. lat. 8° 15'. W. long. 76° 44'.

JURBY POINT, a cape on the N.W. part of the Isle of Man, five miles W. of Ramsey. N. lat. 54° 23'. W. long. 4° 28'.

JURE, DE. See DE FACTO and POSSESSION.

JURE Divino. See *Right to the Crown* and TITHES.

JURE, Quo. See *Quo Jure*.

IVREA, or JUREA, in *Geography*, a town of France, in the department of the Dora, late a city of Piedmont; originally a Roman colony, established there during the sixth consulship of Marius, and the first of Valerius Flaccus; called *Eporedia*. It is situated partly on a plain, and partly

on the declivity of a hill; the number of inhabitants is about 6000; it was the see of a bishop, suffragan of the archbishop of Turin, and the cathedral is said to have been anciently a temple of Apollo. It has a castle joining to the town, and two fortresses. Besides the cathedral, it has three other parish churches, and several religious houses: 20 miles N. of Turin. N. lat. 45° 24'. E. long. 7° 44'.

JUREV PÓVOLSKOI, a town of Russia, in the government of Kofrom, on the Volga; 73 miles E.S.E. of Kofrom. N. lat. 57° 10'. E. long. 43° 14'.

JUREVSKA, a town of Russia, in the government of Olonetz; 42 miles N.E. of Olgskoi.

JURGIANY, a town of Lithuania, in the palatinate of Troki; 28 miles S. of Birza.

JURISTAN, a town of Persia, in the province of Farsistan; 105 miles N. of Schiras.

JURIAGUR, a town of Bengal; 30 miles S.W. of Rongatpour. N. lat. 23° 45'. E. long. 86° 35'.

JURIDICI DIES. See DIES.

JURIEU, PETER, in *Biography*, a celebrated Protestant divine, was born at Mer, a small town four leagues from Blois, in the year 1637. He received part of his education in Holland, but completed his studies in England under his uncle, Peter du Moulin. He was admitted to holy orders in the English episcopal church; but on the death of his father he returned to succeed him at Mer, and submitted to be re-ordained by Presbyters according to the Genevan form. Jurieu, though he differed in many respects from the reformed, set himself up as a rigorous defender of orthodoxy. Either his opinions, or the violence of his temper, obliged him to quit the church at Mer, and another also at Viry, and proved the cause of many mortifications which he met with at Sedan, to which he afterwards went. In 1682, through the influence of his friend Bayle, he obtained the professorship of divinity at Rotterdam, and in connection with this he was appointed minister of the Walloon church in the same city. In 1685, Jurieu published "*Préjugés légitimes contre le Papisme*," in two volumes; which was followed, in the year 1686, by a work intitled "*The Accomplishment of the Prophecies, or the approaching Deliverance of the Church*;" a work in which it is proved that "Popery is the kingdom of Antichrist; that this kingdom is not far from its ruin, and that this ruin is very soon to begin: that the present persecution cannot continue more than three years and a half." With the expectation which the title of this book expresses he published "*Pastoral Letters*," to prepare the minds of the reformed in France for the great revolution. The event soon falsified his predictions; and he acknowledged he had mistaken the time, but firmly believed that God had raised up king William to execute his great design of humbling the persecutor in France, and of bringing about a speedy deliverance of the reformed. After this he embroiled himself in a controversy with his friend Bayle, whom he used extremely ill, as he did many other persons who were the objects of his dislike, and who objected to the extravagance of his opinions. He also offended his best friends by the irascibility of his temper in charging M. Saurin and other eminent persons with heterodoxy. He died at Rotterdam in 1713. His principal works are "*The History of Calvinism and Popery*;" "*On the Unity of the Church*;" "*An Abridgment of the History of the Council of Trent*;" "*History of the Opinions and Religious Ceremonies of the Jews*;" "*Sermons*," &c. Life of Bayle. Moreri.

JURIEWICZE, in *Geography*, a town of Lithuania, in the palatinate of Minsk; 40 miles E. of Minsk.

JURIEWO,

JURIEWO, a town of Lithuania, in the palatinate of Minsk; 20 miles E.N.E. of Minsk.

JURILGUNGE, a town of Bengal, in Chittigong; 35 miles N.N.W. of Islamabad.

JURIN, JAMES, in *Biography*, a physician of the mathematical sect, was, during several years, an active member and secretary of the Royal Society of London, and, at the time of his death, in 1750, was president of the College of Physicians. He distinguished himself by a series of ingenious essays, to the number of seventeen, which were published in the Philosophical Transactions in the years 1718, 1719, &c.; and afterwards printed collectively, in 1732, under the title of "Physico-Mathematical Differtations," in which mathematical science was applied with considerable acuteness to physiological subjects. These papers involved him in several philosophical controversies; first with Keill, in consequence of his calculations in regard to the force of the contractions of the heart, against which also Senac published some objections, which he answered. Jurin computed the contractile force of the heart to be equal to fifteen pounds four ounces; that of the right ventricle being equal to six pounds three ounces, and that of the left to nine pounds one ounce. To Smith's System of Optics, published in 1738, Jurin added "An Essay upon distinct and indistinct Vision," in which he made subtle calculations of the changes necessary to be made in the figure of the eye to accommodate it to the different distances of objects. This paper was commented on by Robins, to whom Jurin wrote a reply. He had likewise controversies with Michelotti respecting the force of running water, and with the philosophers of the school of Leibnitz on living forces. He communicated to the Royal Society some experiments made with a view to determine the specific gravity of the human blood, and he contributed much to the improvement of their meteorological observations. He was a warm partisan and an active defender of the practice of inoculation; and in several publications, giving an account of its success from 1723 to 1727, established its utility upon the true foundation of a comparison between the respective mortality of the casual and the inoculated small-pox. He did not, however, foresee, that this practice, although preserving the lives of those who had recourse to it, yet contributed to increase the mortality in general, in consequence of keeping up an artificial epidemic, as it were, by a constant multiplication of the contagion. His papers in the Philosophical Transactions, are to be found in vols. ix. to lxvi. inclusive. Eloy. Dict. Hist. Gen. Biog.

JURINGI, in *Geography*, a town of Japan, in the island of Nippon; 40 miles W.N.W. of Jedo.

JURIS UTRUM, in *Law*, a writ called the parson's writ of right (Booth. 221.), which lies for the parson of a church, or prebendary, at common law, and for a vicar by stat. 14 Ed. III. c. 17. whose predecessor hath alienated the lands and tenements thereof, by which they may recover lands and tenements belonging to the church, or of which they were disseised; or which were recovered against them by verdict, confession, or default, without praying in aid of the patron and ordinary; or on which any person has intruded since the predecessor's death. (F. N. B. 48, 49.) But since the restraining statute of 13 Eliz. c. 10. whereby the alienation of the predecessor, or a recovery suffered by him of the lands of the church, is declared to be absolutely void, this remedy is of little use, unless where the parson himself has been deforced for more than twenty years (Booth. 221.); for the successor, at any competent time after his accession to the benefice, may enter, or bring an ejectment.

JURISCONSULTUS, or **JURECONSULTUS**, **LECTUS**,

among the Romans, was a person learned in the law; a master of the Roman jurisprudence; who was consulted on the interpretation of the laws and customs, and the difficult points in law-suits.

The fifteen books of the Digest were compiled wholly from the answers, or reports, of the ancient jurisconsulti. Trebonianus, in destroying the two thousand volumes from whence the Code and Digest were taken, has deprived the public of many things, which would have given them light into the office of the ancient jurisconsulti.

We should scarce have known any thing beyond their bare names, had not Pomponius, who lived in the second century, taken care to preserve some circumstances of their office.

The Roman jurisconsulti seem to have been the same with our chamber counsellors, who arrived at the honour of being consulted, through age and experience, but never pleaded at the bar. Their pleading advocates or lawyers never became jurisconsulti.

In the times of the commonwealth, the *advocati* had by much the more honourable employment, as being in the ready way to attain to the highest preferments. They then despised the jurisconsulti, calling them in derision *formularii* and *leguleii*, as having invented certain forms and monosyllables, in order to give their answers the greater appearance of gravity and mystery. But in process of time they became so much esteemed, that they were called *prudentes* and *sapientes*, and the emperors appointed the judges to follow their advice. Augustus at length advanced them to be public officers of the empire; so that they were no longer confined to the petty counsels of private persons.

Bern. Rutilius has written the lives of the most famous jurisconsulti, who have lived within these two thousand years.

JURISDICTION, a power, or authority, which a man has to do justice in cases of complaints made before him. There are two kinds of jurisdiction; the one *ecclesiastical*, the other *secular*.

Secular, belongs to the king, and his justices, or delegates.

The courts and judges at Westminster have jurisdiction all over England, and are not restrained to any county or place; but all other courts are confined to their particular jurisdictions, which if they exceed, whatever they do is erroneous. There are three sorts of inferior jurisdictions; the first is *tenere placita*, to hold pleas, and the plaintiff may sue either there or in the king's courts. Another is the consueance of pleas, where a right is invested in the lord of the franchise to hold pleas; and he is the only person that can take advantage of it, by claiming his franchise. The third sort is an exempt jurisdiction, as where the king grants to some city, that the inhabitants should be sued within their city, and not elsewhere; though there is no jurisdiction that can withstand a *certiorari* to the superior courts. Among the various beneficial regulations of Edward I. he defined the limits of the several temporal courts of the highest jurisdiction, those of the king's bench, common pleas, and exchequer, so as they might not interfere with each other's proper business: to do which they must now have recourse to a fiction, very necessary and useful to the present enlarged state of property. He also settled the boundaries of the inferior courts in counties, hundreds, and manors; confining them to causes of no great amount, according to their primitive institution. See **JUSTICE**, and **COURT**.

Ecclesiastical jurisdiction belongs to bishops and their deputies. See **BISHOP**, and **OFFICIAL**.

Bishops, &c. have two kinds of jurisdiction; the one *internal*,

ternal, which is exercised over the conscience in things purely spiritual; and this they are supposed to hold immediately of God.

The other is *contentious*, which is a privilege some princes have given them in terminating disputes between ecclesiastics and laymen. (See *CONTENTIOUS*.) Edward I. gave a mortal wound to the encroachments of the pope and his clergy, by limiting and establishing the bounds of ecclesiastical jurisdiction; and by obliging the ordinary, to whom all the goods of intestates at that time belonged, to discharge the debts of the deceased.

JURISDICTION, *Encroachment of*, an injury, cognizable by the courts of the common law, which consists in calling one "coram non iudice," to answer in a court that has no legal cognizance of the cause. For this injury the common law has provided a remedy by the writ of prohibition. See *PROHIBITION*.

JURISDICTION, *Plea to the*, is where an indictment is taken before a court that hath no cognizance of the offence: as if a man be indicted for a rape at the sheriff's tourn, or for treason at the quarter sessions: in these, or similar cases, he may except to the jurisdiction of the court, without answering at all to the crime alleged. 2 Hal. P. C. 236. See *DILATORY PLEAS*.

JURISPRUDENCE, the science of what is just and unjust, or of the laws, rights, customs, statutes, &c. necessary for the doing of justice.

Civil jurisprudence is that of the Roman law; *canonical* that of the canon law; and *feudal*, that of fees.

JURJURA, in *Geography*, a mountain of Africa, the highest in Barbary, anciently called the "Mons ferratus." It is, says Shaw (in his *Travels*) at least eight leagues long; and if we except a pool of good water, bordered round with arable ground, that lies near the middle of it, the whole, from one end to another, is a continued range of naked rocks and precipices. In the winter season the ridge of this mountain is covered with snow: and it is remarkable, that whilst the inhabitants of one side of it maintain an hereditary implacable animosity against those of the other, yet, by consent, this border of snow puts a full stop to all hostilities during that season: which, like those of the cranes and pigmies, as related by the poet, are renewed with fresh vigour in the spring:

Ἠγίαι δ' ἀρὰ τανύε κακὴν ἔριδα προΐερον.

Il. γ. v. 7.

This mountain lies between Dellys (Ruscium) and Boujeiah (Saldis).

JURKONE, a town of Hindoostan, in the circar of Kitchwara; 15 miles S. of Budawar.

JURMO, a small island in the Baltic, between the island of Aland and the coast of Finland. N. lat. 60° 33'. E. long. 20° 52'.

JURO, or *DEVIL'S ISLAND*, a small island in the Grecian Archipelago. N. lat. 39° 33'. E. long. 24° 15'.

JUROCO, a town of Brazil, in the province of Minas Geraes; 110 miles S.W. of Villa Rica.

JUROR, **JURATOR**, in a *Legal Sense*, is one of those twenty-four, or twelve men, who are sworn to deliver truth upon such evidence as shall be given them touching any matter in question.

The punishment of petty jurors attainted of giving a verdict contrary to evidence, willingly, is very severe. See *ATTAINT*.

The practice, heretofore in use, of fining, imprisoning, or otherwise punishing jurors, merely at the discretion of the court, for finding their verdict contrary to the direction of

the judge, was arbitrary, unconstitutional, and illegal, and was treated as such by sir Thomas Smith, more than 200 years ago; who accounted "such doings to be very violent, tyrannical, and contrary to the liberty and custom of the realm of England." For, as sir Matthew Hale well observes (2 Hal. P. C. 313.), it would be a most unhappy case for the judge himself, if the prisoner's fate depended upon his directions: unhappy also for the prisoner; for if by the judge's opinion must rule the verdict, the trial by jury would be useless. Yet in many instances, where, contrary to evidence, the jury have found the prisoner guilty, their verdict hath mercifully been set aside, and a new trial granted by the court of king's bench; for in such case, as it hath been said, it cannot be set right by attain. But there hath yet been no instance of granting a new trial where the prisoner was *acquitted* upon the first. 2 Hawk. P. C. 442. Blackitt. Com. b. iv.

JURORS, *Challenge to the*. See *CHALLENGE*.

JUROUDA, in *Geography*, a town of Hindoostan, in the circar of Chandaree; 15 miles S.E. of Seronge.

JUROZEE, a town of Russian Lithuania; 80 miles S.E. of Minsk.

JUR-TCHEREMONSKOI, a town of Russia, in the government of Tobolsk, on the Oby; 68 miles S.W. of Tomsk.

JURVA, a town of Sweden, in the government of Wasa; 32 miles N.N.E. of Christianstad.

JURUCUA, in *Zoology*, the Brazilian name of a species of tortoise. This has feet almost in shape of wings, the fore ones about six inches long, the hinder ones considerably shorter; its tail is short, and of a conic figure; its eyes large and black; its mouth has no teeth, but resembles the beak of a bird. It frequently grows to four feet long, and about three in width; its ribs are fastened to the shell, and are eight on each side; the middle ones of these are the longest, the fore and hinder ones being the shorter. The flesh and eggs of this species are very delicately tasted; they lay their eggs in holes on the sea-shore, covering them over with sand, and leaving them for the sun to hatch them. There are usually a great many very odd figures, like geometrical lines, running in various directions on the shell; the whole ground of the shell is usually black and very glossy, adorned with yellow variegations; but this is no certain character of the species, the varieties in the colouring of these shells being very great. See *TESTUDO MYDAS*.

JURUNCAPEBA, in *Ichthyology*, the name of a sea-fish, of the turdus or wrasse kind, caught about the shores of the Brasils, and called also *itaiara*. It is usually about five or six inches long, about a third part of its length in breadth; its mouth is extremely large and wide, and of a somewhat triangular figure.

It is caught among the rocks, and is a very delicate fish for the table.

JURUNGE, in *Geography*, a town of Hindoostan, in Bahar, on the Bogmutty; 13 miles W. of Durburgh.

JURURA, in *Zoology*, the name of a species of tortoise, common in the Brasils. It is a small kind, seldom exceeding ten fingers in breadth, and eight or nine in length, and of an elliptic figure; its under shell is about nine fingers long, and four and a half broad, and is flat; it can at pleasure hide its whole body in the shell, or thrust out its neck to three fingers' breadth distance; the head is thick and long, the nose elevated and pointed; the mouth is large, and the eyes black; it has four long claws on its feet; its tail is short and pointed; and its skin is rough and scaly. The upper shell is brown, the lower yellow; its eggs are white.

white and round, and about half the size of a hen's egg, and are very well tasted.

JURY, in *Common Law*, signifies twenty-four, or twelve men, sworn to inquire of a matter of fact, and declare the truth, upon such evidence as shall be delivered them touching the matter in question.

The mode of trial by jury, called also the trial "per pais," or "by the country," is very ancient, and seems to have been coeval with the civil government of this nation. Some authors have endeavoured to trace the original of juries up as high as the Britons themselves, the first inhabitants of our island; it is certain, however, that they were in use among the earliest Saxon colonies, their institution being ascribed by bishop Nicholson to Woden himself, their great legislator and captain. Sir John Spelman has represented Alfred as the author of trials by juries; but his proof has not been thought to be decisive. Dr. Pettingal, who has found the use and practice of juries amongst the ancient Greeks and Romans, and who thinks that the rise of the English jury may be deduced from them, has supported his opinion with much ingenuity and learning.

Traces of this mode of trial in Germany have been thought to be visible in the 100 co-assessors, mentioned by Tacitus, as chosen out of the *Ingenui*, which the lord of a territory had when he sat in judgment. This number, says Mr. Carte, prevailed undoubtedly among the Saxons, as it did likewise in all the northern nations, till succeeding times gave occasion to some alterations. Thus, among the Danes, the number of these assessors was restrained to twelve in the time of Redner Ladebrog; and the same number is still kept up in Sweden. When it was first thus reduced in England does not appear from any passage in our old historians. Nevertheless, Mr. Carte infers, that this was the established number in Alfred's time, from his hanging Cadwine for sentencing a man to that kind of death, without the assent of all the twelve jurors, upon whom he had put himself to be tried; and from the laws which he gave to Gothurn. According to the same historian, it is very probable that Alfred was the author of extending to *civil* causes the trial by jury, which had been, perhaps, used before only in *criminal* cases. Sir William Blackstone contends, that this is a mode of trial which has prevailed time out of mind in this nation. Accordingly he says, traces of juries may be found in the laws of all those nations which adopted the feudal system, as in Germany, France, and Italy, and in England we find actual mention of them so early as the laws of king Ethelred, and even then not as a new invention. The truth, Sir William says, seems to be, that this tribunal was universally established among all the northern nations; and so interwoven in their very constitution, that the earliest accounts of one, give us also some traces of the other. On the other hand, there are not wanting considerable names, who refer the introduction of juries into England to a much later period. Dr. Hickes, who finds the original of this institution in Scandinavia, asserts, that it was not known to the Saxons, and that it did not take place in our own country till after the Norman conquest. Mr. Barrington and Dr. Henry, in deference, as it should principally seem, to Dr. Hickes's profound knowledge in Saxon learning, have given their sanction to these sentiments: but it clearly appears that they have done so without sufficient reason. The establishment and use of this mode of trial in our island, though for a time greatly impaired and shaken by the introduction of the Norman trial by battle, were so highly esteemed and valued by the people, that no conquest, no change of government, could ever prevail to abolish it. In "*Magna Carta*" it is more

than once insisted on, as the principal bulwark of our liberties. (See *JUDICIUM parium*.) And it has been ever esteemed, in all countries capable of appreciating its importance and utility, a privilege of the highest and most beneficial nature.

Trials by jury in civil causes are of two kinds; extraordinary and ordinary. The first species of extraordinary trial by jury is that of the grand assize. See *ASSIZES*.

Another species of extraordinary juries, is the jury to try an *Attaint*; which see.

With regard to the ordinary trial by jury in civil cases, when an issue is joined, the court awards a writ of *venire facias*, which is accordingly issued to the sheriff. Thus the cause stands for a trial *at the bar* of the court itself, provided it be of consequence; but all trifling suits are ended in the court baron, hundred, or county courts. However, when the usage began to bring actions of any trifling value in the courts of Westminster-hall, it was found very inconvenient to compel the parties, witnesses, and jurors, to come from the remotest parts of the country to try a trivial action at Westminster; and, therefore, the legislature referred matters in issue to the justices of assize. Accordingly it was enacted by 13 Edw. I. cap. 30. that a clause of *nisi prius* should be inserted in all the writs of *venire facias*, by virtue of which the sheriff returned his jurors to the court of the justices of assize, which was sure to be held in the vacation before Easter and Michaelmas terms, and there the trial was had. But this method was inconvenient, and therefore was altered by 42 Edw. III. cap. 11. which statute enacted, that no inquests, except of assize and gaol delivery, should be taken by writ of *nisi prius*, till after the sheriff had returned the names of the jurors to the court above. It is now the course to make the sheriff's *venire* returnable on the last return of the same term wherein issue is joined, *viz.* Hilary or Trinity terms, which are called issuable terms; and he returns the names of the jurors in a panel, *i. e.* little pane, or oblong piece of parchment, annexed to the writ. This jury is not summoned, and therefore not appearing at the day, must unavoidably make default: for which reason a compulsive process is now awarded against the jurors, called in the common pleas a writ of *habeas corpora juratorum*, and in the king's bench a *distingas*. The entry, therefore, on the roll or record is, "that the jury is respited, through defect of the jurors, till the first day of the next term, then to appear at Westminster; unless before that time, *viz.* on Wednesday the fourth of March, the justices of our lord the king appointed to take assizes in that county shall have come to the place assigned for holding the assizes, &c." And as the judges are sure to come and open the circuit commissions on the day mentioned in the writ, the sheriff returns and summons this jury to appear at the assizes, and there the trial is had before the justices of assize and *nisi prius*; among whom are usually two of the judges of the courts at Westminster, the whole kingdom being divided into six circuits for this purpose. If the sheriff be not an indifferent person, or if he be a party in the suit, or be related either by blood or affinity to either of the parties, the *venire* shall be directed, not to him, but to the coroners; and if any exception lies against them, to two clerks of the court, or to two persons of the county named by the court and sworn, and called *elisors*, or electors, who shall indifferently name the jury, and their return is final. In order farther to remove all suspicion of partiality, it is provided by the statutes 4 Edw. III. cap. 2. 8 Ric. II. cap. 2. and 33 Hen. VIII. cap. 24. that no judge of assize should hold pleas in any county where he was born or inhabits. See 12 Geo. II. c. 27. and *JUSTICES of Oyer, &c.*

When

When the general day of trials is fixed, the plaintiff, or his attorney, must bring down the record to the assizes, and enter it with the proper officer, in order to its being called in court. If it be not so entered, it cannot be tried; therefore it is in the plaintiff's breast to delay any trial by not carrying down the record, unless the defendant undertakes to bring on the trial by giving proper notice to the plaintiff. This proceeding is called the trial by proviso. However, this practice hath begun to be disused, since the statute 14 Geo. II. cap. 17, which enacts, that if, after issue joined, the cause is not carried down to be tried according to the course of the court, the plaintiff shall be esteemed to be non-suited, and judgment shall be given as in case of a non-suit. In case the plaintiff intends to try the cause, he is bound to give the defendant (if he lives within forty miles of London) eight days notice of trial; and if he lives at a greater distance, fourteen days notice; and if he changes his mind, and does not countermand the notice six days before the trial, he shall be liable to pay costs to the defendant for not proceeding to trial, by the last-mentioned statute. The defendant, however, or plaintiff, may, upon good cause shewn to the court above, as upon absence or sickness of a material witness, obtain leave upon motion to defer the trial of the cause till the next assizes. But when the cause is called on regularly in court, the record is conveyed to the judge, while the jury is called and sworn. To this end the sheriff returns his compulsive process, the writ of *habeas corpora*, or *distringas*, with the panel of jurors annexed, to the judge's officer in court. The jurors contained in the panel are either special or common juror. See *SPECIAL JURY*.

A common jury is one returned by the sheriff, according to the directions of the statute 3 Geo. II. cap. 25, which appoints that the sheriff or officer shall not return a separate panel for every separate cause, as formerly; but one and the same panel for every cause to be tried at the same assizes, containing not less than forty-eight, nor more than seventy-two jurors: and that their names, being written on tickets, shall be put into a box or glass: and when each cause is called, twelve of these persons, whose names shall be first drawn out of the box, shall be sworn upon the jury, unless absent, challenged, or excused; or unless a previous view of the lands or tenements, or other matters in question, shall have been thought necessary by the court (stat. 4 Ann. c. 16.); in which case six or more of the jurors returned, to be agreed on by the parties, or named by a judge, or other proper officer of the court, shall be appointed to take such a view, and then such of the jury as have appeared upon the view, shall be sworn on the inquest, previous to any other jurors.

Lists of the jurors qualified according to the acts 4 & 5 W. & M. cap. 24. 7 & 8 W. III. cap. 32. and 3 & 4 Ann. cap. 18. are now to be made from the rates of each parish. The justices at Midsummer sessions are to issue warrants to the high constables who require the petty constables to prepare such lists; and if the high constables neglect to issue their precepts for this purpose, they shall forfeit 10*l*. These lists are to be fixed on the doors of churches, &c. twenty days before Michaelmas, that public notice may be given of persons omitted who are qualified, and of persons inserted, who ought to be omitted. (3 Geo. II. cap. 25.) And if any persons are inserted wrongfully, or omitted for the sake of reward, &c. the petty constable incurs a forfeiture of 20*s*. The lists shall be delivered by the petty constables, at Michaelmas sessions, in open court; or when they are subscribed by them, and attested on oath, and also signed by the justice, they shall be delivered by the petty constables to the high constables, who shall deliver them,

upon oath, in open court. The constable failing to make such return shall forfeit 5*l*. Persons not qualified may be discharged by the justices at the sessions. These lists shall be then fairly entered in a book by the clerk of the peace, on forfeiture of 20*l*. and duplicates of them shall, during the sessions, or within ten days after, be delivered by him to the sheriff, who shall cause the names, with their additions, &c. to be entered in a book of his own; and if the sheriff shall return any person whose name is not in the duplicates, he is liable to a fine not exceeding 10*l*. nor less than 40*s*. (3 Geo. II. cap. 25.) Every summons of jurors shall be made by the sheriff, his officer, or lawful deputy, six days before the sessions at least, in Wales eight days before; and in the counties palatine fourteen days before; and the penalty of neglect, or of excusing any person for favour or reward, is 20*l*. by 7 & 8 W. cap. 32, or a fine of 10*l*. or under, imposed by the judge of assize. (3 Geo. II. cap. 25.) No person shall be summoned, who has served within one year before in the county of Rutland, or two years before in any other county, not being a county of a city or town, and except the counties of York and Middlesex, under a fine not exceeding 5*l*. Every person who has served, shall have a certificate gratis, testifying his attendance. (3 Geo. II. cap. 25.) In the county of York, jurors shall not be returned above once in four years; and the sheriff neglecting his duty shall forfeit 100*l*. and for not discharging a juror, who has served within four years, and giving notice to the party summoned, six days before the assizes or sessions, shall forfeit 20*l*. to the party with full costs. (7 & 8 W. cap. 31. 3 & 4 Ann. cap. 18. and 10 Ann. cap. 14.) In the county of Middlesex, no person shall be returnable to serve as a juror, at any sessions of *nisi prius*, who hath been returned in the two terms or vacations next before, on pain of the sheriff being fined by the judge 5*l*. or under. (4 Geo. II. cap. 7.) And by 7 & 8 W. cap. 32. the inhabitants of the city and liberty of Westminster shall be exempted from serving on any jury at the sessions for Middlesex, by reason of their attendance at the courts of Westminster. By the common law, jurors returned, and not appearing, shall lose and forfeit the issues returned upon them. And if a jurymen be called, and, being present, refuse to appear; or, having appeared, withdraw before he be sworn, the court may fine him at their discretion. (35 Hen. VIII. cap. 6.) And by 29 Geo. II. cap. 19. a juror not appearing and serving in any court of record within the city of London, or in any other city or town corporate, liberty or franchise, after being openly called three times, &c. shall, without reasonable excuse, be fined not more than 40*s*. nor less than 20*s*. And by 3 Geo. II. cap. 25. in causes of *nisi prius*, every person whose name shall be drawn, and who shall not appear without reasonable excuse, shall forfeit not exceeding 5*l*. nor less than 40*s*. If a juror take a bribe of either party, he shall forfeit ten times as much as he hath taken. (5 Edw. III. cap. 10. 34 Edw. III. cap. 8. 38 Edw. III. stat. 1. cap. 12.) If a man assault or threaten a juror for giving a verdict against him, he is punishable by fine or imprisonment; and if he strike him in the court, in the presence of a judge of assize, he shall lose his hand and his goods, and profits of his lands during life, and suffer perpetual imprisonment.

The jury is to be chosen of the same class or rank with the parties, and by the policy of the ancient law, the jury was to come *de vicineto*, from the neighbourhood of the vill or place where the cause of action was laid in the declaration, and for want of this, the array might be challenged for defect of hundredors. However, this practice was entirely abolished by 4 & 5 Ann. cap. 16. upon all civil actions,

actions, except upon penal statutes: and upon those also by the 24 Geo. II. cap. 18. the jury being now only to come, *de corpore comitatus*, from the body of the county at large, and not *de vicineto*, or from the particular neighbourhood. It is also enacted by 28 Edw. III. cap. 13. enforced by 8 Hen. VI. cap. 29. that where either party is an alien born, the jury shall be one half aliens, and the other denizens, if required, for the more impartial trial. But where both parties are aliens, the whole jury are directed to be denizens, by 21 Hen. VI. cap. 4. For other grounds of challenge and qualification of jurors, see CHALLENGE. Jurors in London and Westminster must not only be housekeepers, but have lands or goods worth one hundred pounds; and they may be examined on oath as to that point. (3 Geo. II. cap. 25.) All cities, boroughs, and corporate towns, are excepted out of the act that settles the qualifications of jurors for county assizes or sessions; and triers of felons in corporations may be men worth 40*l.* in goods, though they have no freehold. Jurors in the torn shall have 20*s.* a-year freehold, or 26*s.* 8*d.* copyhold. Any person whatsoever is capable of being put upon the jury in a court-leet, and upon the coroner's jury. The qualifications of jurors, with regard to estate, depend upon a variety of statutes. But by the last statute 3 Geo. II. c. 25. any lease-holder for the term of 500 years absolute, or for any term determinable upon life or lives, of the clear yearly value of 20*l.* *per annum*, over and above the rent reserved, is qualified to serve upon juries. By the common law every grand-juryman ought to be a freeman (1 Hawk. 255.); and a freeholder (2 H. H. 155.) But in Yorkshire, they ought to have 80*l.* a-year, freehold or copyhold. (7 & 8 W. c. 32.) Persons excused from serving on juries are those that are sick and decrepit; those not commorant in the county, and men above seventy years old, by 13 Edw. I. c. 38. and by 7 & 8 Will. III. c. 32. infants under twenty-one. This exemption is also extended, by divers statutes, customs, and charters, to physicians, and other medical persons, counsel, attornies, officers of the courts, and the like; all of whom, if impannelled, must shew their special exemptions. Dissenting teachers, qualified under the toleration act, are exempted, and also quakers. Clergymen are also usually excused; but if they are seised of land and tenements, they are strictly liable to be impannelled in respect of their lay fees, unless they be in the service of the king, or of some bishop.

If, by means of challenges or other cause, a sufficient number of unexceptionable jurors doth not appear at the trial, either party may pray a tales. When the legal number of twelve is obtained, they are then separately sworn, well and truly to try the issue between the parties, and a true verdict to give, according to the evidence; and hence they are denominated the *jury, jurata*, and jurors, *sc. juratores*. Pleadings are then opened to them by counsel on that side which holds the affirmative of the question in issue; the nature of the case, and the evidence intended to be produced are next laid before them by counsel also on the same side; and when their evidence is gone through, the advocate on the other side opens the adverse case, and supports it by evidence; and then the party which began is heard by way of reply. See EVIDENCE.

As to such evidence as the jury may have in their own consciences, by their private knowledge of facts, it was an ancient doctrine, that this had as much right to sway their judgment as the written or parol evidence which is delivered in court; and, therefore, it hath been often held, that though no proofs be produced on either side, yet the jury might bring in a verdict. But this doctrine was gradually exploded, when attaints began to be disused, and new trials

introduced in their stead. And if a juror knows any thing of the matter in issue, he may be sworn as a witness, and give his evidence publicly in court. When the evidence on both sides is gone through, the judge, in the presence of the parties, the counsel, and all others, sums up the whole to the jury; who, unless the case be very clear, withdraw from the bar to consider of their verdict; and, in order to avoid intemperance and causeless delay, they are to be kept without meat, drink, fire, or candle, unless by permission of the judge, till they are all unanimously agreed. And if they eat or drink, or have any eatables about them, without consent of the court, and before verdict, it is finable; and if they do so at his charge for whom they afterwards find, it will set aside the verdict. Also, if they speak with either of the parties or their agents, after they are gone from the bar, or if they receive any fresh evidence in private, or if, to prevent disputes, they call lots for whom they shall find, any of these circumstances will entirely vitiate the verdict. And it has been held, that if the jurors do not agree in their verdict before the judges are about to leave the town, though they are not to be threatened or imprisoned, the judges are not bound to wait for them, but may carry them round the circuit from town to town in a cart. When they are all unanimously agreed, the jury return back to the bar; and before they deliver their verdict, the plaintiff is bound to appear in court, by himself, attorney, or counsel, in order to answer the amercement, to which by the old law he is liable, in case he fails in his suit, as a punishment for his false claim; a form which is still continued, though the amercement is disused; and if the plaintiff does not appear, no verdict can be given, but the plaintiff is said to be *non-suit*. But in case the plaintiff appears, the jury by their foreman deliver in their verdict. When the jury have delivered in their verdict, and it is recorded in court, they are then discharged. Such is the process of trial by jury in civil cases; a trial which, besides the other vast advantages which attend it, is as expeditious and cheap, as it is convenient, equitable, and certain. On these accounts, says judge Blackstone, "the trial by jury ever has been, and I trust ever will be, looked upon as the glory of the English law." It is "the most transcendent privilege which any subject can enjoy, or wish for, that he cannot be affected either in his property, his liberty, or his person, but by the unanimous consent of 12 of his neighbours and equals. A constitution, that I may venture to affirm, has, under Providence, secured the just liberties of this nation for a long succession of ages, and therefore a celebrated French writer (Montesquieu), who concludes, that because Rome, Sparta, and Carthage, have lost their liberties, therefore those of England must in time perish, should have recollected, that Rome, Sparta, and Carthage, at the time when their liberties were lost, were strangers to the trial by jury." This trial by jury, which is the grand bulwark of our liberties, as Englishmen, is secured to us by the great charter, 9 Hen. III. c. 19. The antiquity and excellence of this trial, for the settling of civil property, have been already briefly stated. But if it has so great advantage in regulating civil property, how much must that advantage be heightened, when it is applied to criminal cases! "In times of difficulty and danger," as Blackstone has well observed, "more is to be apprehended from the violence and partiality of judges appointed by the crown, in suits between the king and the subject, than in disputes between one individual and another, to settle the metes and boundaries of private property. Our law has therefore wisely placed this strong and twofold barrier, of a presentment and a trial by jury, between the liberties of the people, and the prerogative of the crown."—"The founders of the

English.

English law have with excellent forecast contrived, that no man should be called to answer to the king for any capital crime, unless upon the preparatory accusation of 12 or more of his fellow-subjects, the grand jury; and that the truth of every accusation, whether preferred in the shape of indictment, information, or appeal, should afterwards be confirmed by the unanimous suffrage of 12 of his equals and neighbours, indifferently chosen, and superior to all suspicion. So that the liberties of England cannot but subsist, so long as this *palladium* remains sacred and inviolate: not only from all open attacks, (which none will be so hardy as to make), but also from all secret machinations, which may sap and undermine it; by introducing new and arbitrary methods of trial, by justices of the peace, commissioners of the revenue, and courts of conscience. And however *convenient* these may appear at first, (as, doubtless, all arbitrary powers, well executed, are the most *convenient*;) yet let it be again remembered, that delays, and little inconveniences in the forms of justice, are the price that all free nations must pay for their liberty in more substantial matters; that these inroads upon this sacred bulwark of the nation are fundamentally opposite to the spirit of our constitution; and that, though begun in trifles, the precedent may gradually increase and spread, to the utter dilute of juries in questions of the most momentous concern."

In criminal cases, it is provided by the equity and lenity of the English laws, that no man should be called to answer for any capital crime, unless, as we have already stated, upon the preparatory accusation of twelve or more of his fellow-subjects, called the *grand jury*. This jury considers all bills of indictment against criminals preferred to the court, which they either approve or find, by writing upon them *billa vera*, or disallow, by indorsing *ignoramus*, and generally consists of gentlemen that are freeholders of superior quality to those who form the *petit jury*, who try the prisoners indicted by the other jury, and convict them by verdict.

When a prisoner, on his arraignment, has pleaded not guilty, and for his trial hath put himself upon the country, which country the jury are, the sheriff of the county must return a panel of jurors that are freeholders, without just exception, and of the *vicine*, or neighbourhood, *i. e.* of the county where the fact is committed. If the proceedings are before the court of king's bench, there is a time allowed, between the arraignment and the trial, for a jury to be impanelled by a writ of *venire facias* to the sheriff, as in civil causes; and the trial in case of a misdemeanour, is had at *nisi prius*, unless it be of such consequence as to merit a trial at bar; which is always invariably had, when the prisoner is tried for any capital offence. But, before commissioners of *oyer and terminer*, and gaol delivery, the sheriff, by virtue of a general precept, directed to him beforehand, returns to the court a panel of forty-eight jurors, to try all felons that may be called upon their trial at that session; and, therefore, it is usual to try all felons immediately, or soon after their arraignment. But persons indicted of smaller misdemeanours, usually give security to the court to appear, for trial at the next assizes or session. See INDICTMENT.

When the trial is called on, the jurors are to be sworn, as they appear to the number of twelve, unless they are challenged by the party. (See CHALLENGE, & *supra*.) *Tales* may be awarded as in civil causes, till the number of twelve is sworn, "well and truly to try, and true deliverance make, between our sovereign lord the king, and the prisoner whom they have in charge; and a true verdict to give, according to the evidence." When the jury is sworn, if it be a cause of any consequence, the indictment is usually opened, and the evidence stated by the counsel for the crown,

or prosecution. But it is a settled rule at common law (inconsistent, indeed, with the humane treatment of prisoners by the English laws, but palliated by the declaration of law, that the judge shall be counsel for the prisoner, *i. e.* shall see that the proceedings against him are legal and strictly regular) that no counsel shall be allowed a prisoner upon his trial, upon the general issue, in any capital crime, unless some point of law should arise proper to be debated. (2 Hawk. P.C. 400.) However, the judges never scruple to allow a prisoner counsel to stand by him at the bar, and instruct him what questions to ask, or even to ask questions for him, with respect to matters of fact; for as to matters of law, arising on the trial, they are entitled to the assistance of counsel. When the evidence on both sides is closed, the jury cannot be discharged, (unless in cases of evident necessity,) till they have given in their verdict; but are to consider of it and deliver it in, with the same forms as upon civil causes; only that they cannot, in a criminal case, give a *privy verdict*. (2 Hal. P.C. 300. 2 Hawk. P.C. 439.) But an open verdict may be either general, guilty or not guilty; or special, setting forth all the circumstances of the case, and praying the judgment of the court, whether, for instance, on the facts stated, it be murder, manslaughter, or no crime at all. (See VERDICT and JURORS.) If the jury find the prisoner not guilty, he is then for ever discharged of the accusation, except he be appealed of felony within the time limited by law. (See APPEAL.) And upon such his acquittal, or discharge for want of prosecution, he shall be immediately set at large, without payment of any fee to the gaoler. (Stat. 14 Geo. III. c. 20.) But if they find him guilty, he is said to be *convicted* of the crime whereof he stands indicted. On a conviction for any felony, in general, the reasonable expences of prosecution are, by stat. 25 Geo. II. cap. 36. and 18 Geo. III. c. 19. to be allowed to the prosecutor out of the county stock, if he petitions the judge for that purpose; and if he be poor, a compensation for his trouble and loss of time; and by 27 Geo. II. cap. 3. explained by stat. 18 Geo. III. c. 19. poor persons bound over to give evidence are likewise entitled to be paid their charges, as well without conviction as with it. Moreover, on a conviction of larceny in particular, the prosecutor shall have restitution of his goods, by 21 Hen. VIII. cap. 11. which enacts, that if any person be convicted of larceny by the evidence of the party robbed, he shall have full restitution of his money, goods, and chattels; or the value of them out of the offender's goods, if he has any, by a writ to be granted by the justices; and this writ shall reach the stolen goods, though the property of them is transferred to another by sale in open market. (1 Hal. P.C. 543.) Without such writ of restitution, the party may peaceably retake his goods wheresoever he finds them. And if the felon be convicted and pardoned, or allowed his clergy, the party robbed may bring his action of trover against him for his goods, and recover a satisfaction in damages. Such are the proceedings and consequences of a trial by jury in criminal cases. See Blackst. Comm. book iii. iv.

JURY, Special. Where it is conceived that an indifferent impartial jury will not be returned between party and party by the sheriff, the court upon motion will order the sheriff to attend the secondary of the king's bench, with his book of freeholders of the county; and the secondary, in the presence of the attornies on both sides, is to strike a jury. And when a cause of consequence is to be tried at the bar, the court of king's bench, on motion and affidavit made, will make a rule for the secondary to name forty-eight freeholders; and each party is to strike out twelve, one at a time, the plaintiff, or his attorney, beginning first; and from

from the remainder the jury for the trial are to be drawn. This is called a *special jury*.

By the stat. 3 Geo. II. cap. 25. either party is entitled upon motion to have a special jury struck upon the trial of any issue, as well at the assizes as at bar; he paying the extraordinary expence, unless the judge's writ certify, in pursuance of the stat. 24 Geo. II. cap. 18. that the cause required such special jury. And no person serving on a special jury shall be allowed more than the sum which the judge shall think reasonable, not exceeding one guinea, except in cases where a view is directed. When any special jury shall be ordered by rule of the court of Westminster, in any cause arising in any city, &c. the jury is to be taken out of lists, or books of persons qualified, which shall be produced by the sheriffs, &c. before the proper officer. The same indulgence is granted both to merchants and foreigners; for where two merchants are plaintiff and defendant, a jury of merchants may be returned to try the issue between them; and if either of the parties in the suit be an alien, the jury, at the desire of the party, is to be composed of half foreigners and half English.

JURIES, Clerk of the. See CLERK.

JURY of Matrons. See MATRONS.

JURY-MAST, an appellation given by seamen to a temporary or occasional mast, patched up of yards, or other pieces of timber, and set up in the room of a true mast, which has been lost in a fight, or by a storm.

JURZEC, in *Geography*, a town of Lithuania, in the palatinate of Minsk; 20 miles N. of Rohaczow.

JUS, and *JURA*. See LAW, RIGHT, &c.

Jus accrescendi, in *Law*, is the right of survivorship between joint-tenants.

Jus ad rem, is an inchoate and imperfect right, such as a parson promoted to a living acquires by nomination and institution; in contradistinction to the *jus in re*, or complete and full right, by corporal possession.

Jus Anglorum, denotes the law and customs of the West Saxons, in the time of the heptarchy, by which the people were for a long time governed, and which were preferred before all others.

Jus coronæ, rights of the crown, is part of the law of England, which differs in many things from the general law concerning the subject. Coke on Litt.

The king may purchase lands to him and his heirs, but he is seised thereof in *jure coronæ*; and all the lands and possessions, whereof the king is thus seised, shall follow the crown in descents, &c. See PREROGATIVE.

Jus curialitatis Angliæ. See COURTESY.

Jus duplicatum. See RIGHT.

Jus fiduciarium, in the *Roman Law*, a right in trust for which there was a remedy in conscience.

Jus gentium, is the law by which kingdoms, and society in general, are governed.

Jus gladii is mentioned in our Latin authors, and the Norman laws, where it signifies a supreme jurisdiction. Cand. And hence it is, that at the creation of an earl, he is said to be *gladio succinctus*, to signify that he had a jurisdiction over the county of which he was made earl. See PLEAS of the Sword.

Jus imaginum was the foundation of civil nobility among the Romans, and denoted having the image of one ancestor at least, who had borne some curule office.

Jus legitimum, in the *Roman Law*, a legal right which was remedied by the ordinary course of law.

Jus patronatus, is a commission granted by the bishop to some persons to enquire who is the rightful patron of a church. If two patrons present their clerks, the bishop shall deter-

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mine who shall be admitted by right of patronage, &c. on commission of enquiry by six clergymen and six laymen, living near the church; who are to enquire on articles as a jury, whether the church is void? who presented last? who is the rightful patron? &c. But if coparceners severally present their clerks, the bishop is not obliged to award a *jus patronatus*, because they present under one title; and are not in like cases, where two patrons present under several titles. The awarding a *jus patronatus* is not of necessity, but at the pleasure of the ordinary, for his better information who hath the right of patronage: for if he will at his peril take notice of the right, he may admit the clerk of either of the patrons, without a *jus patronatus*.

Jus precarium, in the *Roman Law*, a right in courtesy, for which the remedy was only by intreaty or request.

Jus quale. See QUALE *jus*.

Jus togæ. See TOGA.

JUSKPOUR, in *Geography*, a circar of Hindoostan, in the country of Orissa, bounded on the N. by Surgooja, on the E. by a part of Bahar, on the S. by the circars of Gangpour and Ruttunpour, and on the W. by Ruttunpour. The capital is Odeypour.

JUSOFIE, a town of Arabia, in the province of Hadsjar, on the S. coast of the Persian gulf. N. lat. 25° 34'. E. long. 50° 30'.

JUSQUIAMUS, in *Botany*, a name used by some authors for the hyoscyamus, or henbane.

JUSSAUHA, in *Geography*, a town of Hindoostan, in Moultan; 14 miles W. of Toulomba.

JUSSEY, a town of France, in the department of the Upper Saone, and chief place of a canton, in the district of Vesoul, situated on the Amand; 15 miles N.W. of Vesoul. The place contains 3033, and the canton 14,776 inhabitants, on a territory of 227½ kilometres, in 22 communes. N. lat. 47° 49'. E. long. 5° 59'.

JUSSIÆA, in *Botany*, so named by Linnæus, (who, as it appears by his Tour in Lapland, v. 1. 284, had at first destined for this purpose the plant he afterwards called *Sibbaldia*), in honour of the two illustrious brothers Antony and Bernard de Jussieu. The former was professor of botany at Paris, and wrote numerous papers in the Memoirs of the academy, being also the editor of the work of Barrelier. He was born at Lyons in 1686, and died at Paris, where he practised medicine, in 1758, aged 72. His brother Bernard, a first rate botanist, who, as Haller observes, was deterred by excess of modesty from giving his ideas to the world, was one of the first who laboured at a natural system of arrangement. His nephew, the present A. L. de Jussieu, has given us a plan of his method, according to which the garden of Trianon was arranged in 1759, and which in fact laid the foundation of his own celebrated work, published in 1789. Bernard de Jussieu was demonstrator of botany at the Jardin du Roi, and died in 1777, aged 79. A third brother, Joseph, travelled to South America as a surgeon, and sent home dried specimens of many curious plants.—Linn. Gen. 215. Schreb. 292. Willd. Sp. Pl. v. 2. 574. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2. 63. Juss. 319. Lamarck. Illustr. t. 280. Gertn. t. 31.—Clats and order, *Decandria Monogynia*. Nat. Ord. *Calycanthemæ*, Linn. *Onagraceæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, in five, (sometimes but four,) ovate, acute, permanent segments. *Cor.* of five, (sometimes but four,) roundish, spreading, sessile, equal petals. *Stam.* Filaments ten, (sometimes eight,) very short, thread-shaped; anthers roundish. *Pist.* Germin oblong, prismatic, inferior; style thread-shaped; stigma capitate, flat, marked with five streaks. *Peric.* Capsule oblong, angular,

gular, of four or five cells, bursting at the angles, crowned with the calyx. *Seeds* numerous, small, smooth, and polished, disposed in rows upon the angles of the central column, which are opposite to the partitions, the latter originating from the centre of each valve. See GÆRTNER.

Eff. Ch. Calyx superior, of four or five leaves. Petals four or five, equal. Capsule of four or five cells, oblong, bursting at the angles; partitions from the middle of the valves. *Seeds* numerous, minute.

Obf. Gærtner asserts the difference between this genus and *Enothera* to be merely factitious and imaginary. In our opinion the permanent, leafy, equal calyx, destitute of a tube, and the smooth, round, not angular nor spongy, seeds, are sufficient to mark *Jussiaea*, not to mention the undivided stigma, which in this tribe is perhaps of no great moment.—As to its place in the Linnæan system we are less decided, and think Lamarck most correct in removing it to *Oxandria*.

The greater number of the species are natives of the warmer parts of America; a few are found in the East Indies, or in Guinea. Linnæus defines five in his *Species Plantarum*; Willdenow has twelve.

1. *J. repens*, Linn. Sp. Pl. 555, (Nir-carambu; Rheede Hort. Mal. v. 2. 99. t. 51.)—Stem creeping. Leaves obovate, obtuse. Flowers five-cleft. Calyx-leaves lanceolate.—This is truly an East Indian species, growing in watery places, and throwing out from its procumbent branched stem, large tufted fibrous perennial roots. The herbage is smooth. Leaves alternate, stalked, obovate, entire, veiny, obtuse, often emarginate, an inch or more in length. Flowers on solitary, simple, axillary stalks, shorter than the leaves, but the ripe fruit and stalk together are about as long as each leaf. Segments of the calyx five, lanceolate, narrow, acute, entire. Petals five, roundish, whitish, with orange-coloured claws. *J. ascendens*, Linn. Mant. 69, appears to be the very same plant, described from a specimen, whereas *J. repens* was originally taken up from books.

2. *J. inclinata*, Linn. Suppl. 235, (*J. erecta*; Amœn. Acad. v. 8. 256.)—Stem ascending. Leaves obovate, obtuse. Flowers four-cleft. Calyx-leaves elliptical, broad.—Sent from Surinam by Dalberg, being a part of the collection preserved in spirits, which king Gustavus III. gave Linnæus. The latter at first mistook this species for a totally different one, *erecta*. It is more akin to *repens*, but larger, and the above specific character sufficiently marks it. The very broad calyx-leaves are remarkable.

3. *J. peruviana*, Linn. Sp. Pl. 555. (*Onagra laurifolia*, flore amplo pentapetalo; Feuill. Peruv. 716. t. 9, not 11.)—Stem erect. Leaves elliptic-lanceolate, acute, roughish. Flowers four or five-cleft. Calyx-leaves ovate, pointed, toothed.—Gathered by Feuillée about the sides of rivers in the plain of Lima. He reports that the natives highly esteem the bruised leaves, as a cooling application to dispel tumours. Mutis sent Linnæus a specimen from Mexico, which answers precisely to Feuillée's plant, except the flowers being four-cleft, upon which we lay no stress. The toothed calyx in our's is remarkable. The petals are large and yellow. Leaves roughish with short, rigid, scattered hairs; their under side pale.

4. *J. hirta*, Willd. n. 6. (*Enothera hirta*; Linn. Sp. Pl. 491. *Onagra frutescens et hirsuta, nerii folio, flore magno-luteo*; Plum. Ic. 167. t. 174. f. 2.)—Stem erect, hairy. Leaves elliptic-lanceolate, acute; hairy beneath. Flowers four-cleft. Calyx-leaves ovate, pointed, entire.—Known to us only by Plumier's figure, who gathered it in some part of South America. If that figure be exact, the entire calyx, and more hairy herbage, distinguish it from the

last. Willdenow has properly followed Swartz and Vahl in removing it from *Enothera*.

5. *J. pubescens*, Linn. Sp. Pl. 555. Loeß. It. 282. n. 205.—Stem upright, hairy. Leaves oblong. Flowers five or six-cleft. Calyx-leaves lanceolate, pointed, hairy beneath.—Gathered by Loeßing in South America. We have an unnamed specimen which answers well enough to the short accounts of this species given by authors. Of the synonym of Sloane we do not presume to judge with certainty, but it appears to belong to *J. peruviana*. The stem of our plant is erect, clothed with loose, spreading, white hairs, as are also the leaves more or less, the long slender germen, and backs of the calyx-leaves. The latter are six in every flower we have examined, lanceolate, taper-pointed, wavy, scarcely crenate, very smooth above. Petals six, white or yellowish. Leaves linear-lanceolate, near two inches long, on short hairy stalks.

6. *J. suffruticosa*, Linn. Sp. Pl. 555. (Cattu-carambu; Rheede Hort. Mal. v. 2. 97. t. 50.)—Stem erect, much branched. Leaves lanceolate, downy. Flowers four-cleft. Calyx-leaves ovate, downy beneath.—Native of the East Indies, flowering during the rainy season. The whole plant, two or three feet high, is usually clothed with dense soft pubescence, though occasionally nearly smooth. Leaves numerous, lanceolate, almost sessile, about two inches long. Fruit nearly as long. The ovate four-leaved calyx, downy, not hairy, beneath, essentially distinguishes it from the last. Linnæus adopted this species from books; and though he had specimens, never rightly determined them.

7. *J. octovalvis*, Swartz. Obf. 142. (*Enothera octovalvis*; Jacq. Amer. 102. t. 70. Linn. Sp. Pl. 492. *Onagra foliis perficariæ angustioribus, flore magno luteo*; Plum. Ic. 168. t. 175. f. 1.)—Stem erect. Leaves lanceolate, downy. Flowers four-cleft. Calyx-leaves ovate. Capsule of eight valves. Native of wet places in the West Indies. This seems to be the plant incorrectly figured by Merian, Inf. Surin. t. 39. There is great difficulty in distinguishing it specifically from the last, as we have seen no specimen, but we have no doubt of their being different. The present is said to be an annual plant. The petals are yellow, and inversely heart-shaped.

8. *J. erecta*, Linn. Sp. Pl. 556. Swartz. Obf. 173. (*Onagra foliis perficæ amplioribus, parvo flore luteo*; Plum. Ic. 168. t. 175. f. 2. Carambu; Rheede Hort. Mal. v. 2. 95. t. 49.)—Stem erect. Leaves lanceolate, smooth. Flowers four-cleft, sessile. Calyx-leaves lanceolate.—Native of marshy places in both Indies. The root is said to be annual. Whole plant smooth or nearly so. Leaves two or three inches long, stalked, lanceolate, pointed. Flowers small, yellow, axillary, sessile. Calyx-leaves slightly downy and three-ribbed beneath. Fruit obovate, not an inch long, the membranous sides, between the ribs, becoming torn to let out the seeds.

9. *J. acuminata*, Swartz. Ind. Occ. v. 2. 745.—Nearly erect, smooth. Leaves lanceolate, broad, tapering at each end. Flowers four-cleft, nearly sessile.—In low ground in the south part of Jamaica, but rare. Swartz. This differs from the last in the singularly taper-pointed leaves, and in the stem being decumbent at its base.—The calyx-leaves, moreover, are described as somewhat ovate.

10. *J. tenella*, Burm. Ind. 103. t. 34. f. 2.—Erect, smooth. Leaves lanceolate, opposite. Flowers five-cleft, nearly sessile.—Native of Java. A small plant much branched. Leaves (according to Burmann) opposite, an inch long. The Camaranbaya of Marcgrave, 30. f. 1, which he quotes, is more like *J. octovalvis*.

11. *J. linearis*, Willd. n. 3.—Leaves linear, sessile, hispid.

hispid. Flowers four-cleft.—Native of Guinea. *Stem* erect, branched, smooth, striated, round, clothed with scattered hairs at the top. *Leaves* two inches or more in length, bluntnish, sessile, alternate, scarcely veiny, rough with minute, rigid, upright hairs. *Flowers* sessile, axillary. *Germs* hispid.

12. *J. linifolia*. Vahl. Eclog. v. 2. 32. Willd. n. 4. Leaves and calyx-leaves linear-lanceolate, smooth. Flowers sessile, four-cleft.—Native of South America. *Stem* herbaceous, erect, slender, smooth, branched, angular. *Leaves* nearly sessile, scarcely an inch long, narrow, tapering at each end. *Flowers* axillary. *Leaves* of the calyx four, lanceolate, tapering, about one-fourth of an inch long. *Capitule* an inch long, slender, round and smooth. Vahl. S.

JUST, the measured can or cup out of which the monks used to drink their liquor. It appears from the Monasticon, that the monks of Evesham Abbey were allowed two jugs of beer every day; and we are informed by William of Malmesbury, that those of Glastonbury, about the time of the Conquest, had their jugs filled with hydromel or mead on great festival days.

JUST, a sportive kind of combat on horseback; man against man, armed with lances.

The word is by some derived from the French *jouste*, of the Latin *juxta*, because the combatants fought near one another. Salmasius derives it from the modern Greek *Zoustra*, or rather *ζουστρα*; which is used in this sense by Nicephorus Gregoras. Others derive it from *justa*, which, in the corrupt age of the Latin tongue, was used for this exercise, because it was supposed a more just and equal combat than the tournament.

Anciently, jugs and tournaments made a part of the entertainment at all solemn feasts and rejoicings. The Spaniards borrowed these exercises from the Moors, and called them *juego de canas*, *reed* or *cane-play*. Some take them to be the same with *ludus Trojanus*, anciently practised by the youth of Rome.

The Turks use them still, and call them *lancing the gerid*.

The difference between jugs and tournaments consists in this, that the latter is the genus, of which the former is only a species. Tournaments included all kinds of military sports and engagements, which were made out of gallantry and diversion. Jugs were those particular combats where the parties were near each other, and engaged with lance and sword; add, that the tournament was frequently performed by a number of cavaliers, who fought in a body; the jug was a single combat of one man against another. Though the jugs were usually made in tournaments, after a general encounter of all the cavaliers, yet they were sometimes singly, and independent of any tournament.

He who appeared for the first time at a jug, forfeited his helm, or casque, unless he had forfeited before at a tournament.

JUST Appui. See APPUI.

JUST, in *Biography*, a graceful and pleasing composer of short and easy progressive lessons for beginners on the harpichord or pianoforte, in Holland, about 30 years ago.

JUST, *St.*, in *Geography*, a town of France, in the department of the Oise, and chief place of a canton, in the district of Clermont; 9 miles N. of Clermont. The place contains 823. and the canton 10,620 inhabitants, on a territory of 202½ kilometres, in 22 communes.—Also, a town of France, in the department of the Marne; 10 miles S.S.E. of Sezanne.—Also, a town of France, in the department of the Aveyron; 6 miles S.S.E. of Sauveterre.

JUST en Chevalet, *St.*, a town of France, in the department of the Loire, and chief place of a canton, in the district of Roanne; 12 miles S.W. of Roanne. The place contains 2346, and the canton 9149 inhabitants, on a territory of 217½ kilometres, in 8 communes.

JUSTABAS, a town of South America, in the province of Tucuman; 45 miles N.W. of St. Fernando.

JUSTELL, CHRISTOPHER, in *Biography*, was born at Paris in 1580. Having laid a good foundation in elementary learning at school and at college, he applied his maturer studies to ecclesiastical history, and became the author of many learned works. He died at the age of 69 in the year 1649. His principal pieces are, “Codex Canonum Ecclesiæ Universæ à concilio Calchedonenſi et Justiniano Imp. Confirmatus Gr. et Lat.,” “Codex Canonum Ecclesiasticorum Dionysii Exigui,” &c.; “Codex Canonum Ecclesiæ Africanæ, Gr. et Lat.,” “Bibliotheca Juris Canonici Veteris,” “A Genealogical History of the House of Auvergne,” &c. Justell was supposed to be better acquainted with the civil history and antiquities of the middle age than any person of his time. He kept up a correspondence with most of the literary characters of his time, among whom were archbishop Usher and sir Henry Spelman.

JUSTICE, in a general sense, or *universal* justice, comprehends the whole duty of man to God, to his neighbour, and to himself. In this latitude the term “righteousness” often occurs in scripture. Cicero was not ignorant (De Nat. Deor. l. i. § 41.) that justice expresses more than the performance of the duties owing to our fellow-creatures; for according to his statement, “Est enim pietas justitia adversum Deos,” *i. e.* Piety is justice towards the gods.

JUSTICE, *Justitia*, in a more restricted sense, and considered as a social virtue, denotes a constant desire, or inclination, to give every one his due; or a habit by which the mind is disposed and determined to give every man his own. Accordingly justice has a necessary respect to the persons and rights of others. As there is a twofold right (see RIGHT), there is also a correspondent distinction of justice. A right is either perfect or imperfect. A *perfect* right is that which persons have to things properly their own, the rendering of which is the payment of a debt, rather than the conferring of a favour: a right which human laws, as well as divine, generally allow men to challenge, and assist them to recover. I am not obliged to every one who does not rob or murder me. Thus also, the making of a promise may be free, but the performance of it is not so. An *imperfect* right detracts nothing from the kindness, respect, and good will of those who give to others what they can only claim by virtue of such a right; but leaves to such actions their full lustre and merit. Notwithstanding any such right, men are obliged to their benefactors for doing what they could not have been constrained to do, and which demonstrate the goodness and generosity of their temper; being an act of justice, so as at the same time to have the nature of a gift. The offices of civility, gratitude, and charity rest on this foundation. Justice, grounded on this distinction of right, is distinguished into *simple* and *mixed*; or, according to Puffendorf, *universal* and *particular*; or, according to Grotius, *expletory* and *attributive*. By *simple* justice, we may understand justice in the strictest sense of the term, of which Cicero says (De Offic. l. iii. c. 6.), “Hæc una virtus omnium est domina et regina virtutum,” *i. e.* “It is the mistress and queen of all the other virtues.” By *mixed* justice, we may understand that which has other virtues joined with it, as humanity, liberality, and the like. Thus Cicero says (De Offic. l. i.

c. 7, 8.), "*Iustitiæ conjuncta est beneficentia*:" Beneficence is connected with justice. And again, "*Injustitiæ duo genera*," &c. There are two kinds of injustice, one of those who do an injury to others; another with which they are chargeable, who neglect to vindicate and defend the injured, when it is in their power. To the same purpose Antoninus says (*πρὸς Σελυβίαν*, l. ix. c. 5.), "A man may be unjust not only by *doing*, but *neglecting* to do something." These philosophical writers seem evidently to have thought, that the duties of humanity are parts of justice properly so called. *Simple* justice we have already defined, agreeable to the accurate definition of it in the civil law. "*Iustitia est constans et perpetua voluntas jus suum cuique tribuendi*:" i. e. Justice is a constant and prevailing will, or disposition, to render to every one his due.

Justice doth not derive its being from fear, as is affirmed by Mr. Hobbes, who supposes mankind in their natural state to have a licence uncircumscribed by any other bounds, besides their own natural force. This licence they are induced to exchange for a more limited right in society, to prevent that war of every one with every one, which would be the consequence of every one's insisting upon his natural rights. "According to this hypothesis," as Dr. Cudworth well observes (*Intellect. System*), "justice and civil government are plainly things not good in themselves, nor desirable (being a hindrance of liberty, and nothing but shackles and fetters), but by accident only, as necessary evils. They are lesser evils submitted to purely for the sake of avoiding a greater. Hence it inevitably follows, that all men must be *ἀκοντες* *δικαιοι*, unwillingly just, or not with a full and perfect, but mixed will only." The true principles of justice are such as these: It is reasonable that *his* will, who is the common father of mankind, should be the measure of their behaviour one towards another. It can never be thought a thing pleasing to God, who has originally the same affection for one as for another, that one man, by fraud or violence, should usurp dominion over another, or any way molest or hinder him. Besides, this would introduce confusion into his works, the glory of which is their order and harmony. "If it be the disposition of mankind," says Cicero (*De Offic.* l. iii. § 5.), that every one for his own advantage should oppress and rob his neighbour, it is necessary that society, which is the most natural state of mankind, be entirely dissolved. Just as in the human body, the whole must be weakened and destroyed, if every member could have this persuasion, and act upon it; that it should flourish by drawing to itself the strength and nourishment of the member nearest to it." Thus from that original and universal society to which all mankind belong, necessarily flow obligations to mutual justice; and Mr. Hobbes's state of war appears to contradict the very first view of human nature. But besides this general society, particular civil societies have, by the direction of nature, been erected in several parts of the world. The Author of nature has formed his rational creatures with a strong bent and inclination to combine into bodies politic. It is inclination, therefore, which makes men seek society, not the bare prospect of benefiting themselves by it; to satisfy nature more than to defend themselves from violence. When societies are formed, though justice be necessary to make them flourish, and hence we infer the will of the great governor of the world; yet in the nature of things, the obligation to justice is antecedent to any society whatsoever. From the inclination to society with which God hath made man, we infer his will to be, that justice should be cultivated, which is necessary to the support of society; but civil society is not the original of justice. Another prin-

ciple of justice is, that the good of the whole is to be preferred before the good of any one part. Is it good, pleasing to a most benevolent creator, and consequently deserving the approbation and concurrence of every rational agent, that *this* or *that* man should be happy? It is much better that a greater number, and best of all that all should be so. But how can all men be made happy, without a constant regard to the rules of justice. Bishop Cumberland (*De Legibus Naturæ*, cap. i. § 23.) not only resolves justice, with the several duties annexed to it, into this principle, but even the right of self-preservation. Farther, it is altogether reasonable, that we should, or should not do to another, what we would, or would not that he should do unto us. Every man is agreed to think every other man unjust, who deprives him of any good thing which he lawfully enjoys. We should therefore consider, that others may reasonably expect of us, whatever we may reasonably demand from them. Moreover, all men have their rights and properties. He that is born to least, is born with a right to life, liberty, and safety. If there be right, there must be justice: these mutually suppose one another. Again, whatever is enjoyed or possessed by a moral agent, independently of another, may be used, enjoyed, and encouraged, without being subject to the controul of that other; provided that the possessor has not alienated or forfeited his right; and that he uses it not to the prejudice of any other person. Upon this principle is founded the natural equality of mankind, that is, an equality of right. This equality subsists in all the essentials of being and happiness, under all the changes of condition to which every man is liable. Let a man's condition be what it will, high or low, rich or poor, a prince or a subject, as he has an equal right to what he lawfully possesses, with that which any other man can have; so there are certain possessions, the right of which he cannot transfer to another; of which number are life, limbs, and liberty, both civil and religious: in all which respects, therefore, the meanest person, while innocent, is equal to the greatest among men. Mr. Hobbes indeed (*De Cive*, l. i. c. 1. § 3.) proves the equality of mankind from the equal power they have of doing mischief. M. Barbeyrac observes, that this equality may be called an equality purely physical; whereas it is a moral equality, or an equality of right, that must be laid as the foundation of justice. Puffendorf deduces this equality of mankind from the sameness of nature; which seems to make it, as well as that of Mr. Hobbes, a physical equality. Of Mr. Godwin's sentiments concerning the subject under present discussion, we shall probably have occasion to give some account under the articles *POLITICS*, *SOCIETY*, and *VIRTUE*.

Having briefly stated the great principles of justice, we shall now proceed to the division of it. According to Aristotle, justice is *universal* or *particular*. *Universal* justice consists in the observance of the laws, which extend to all the actions of mankind capable of good or evil, and thus comprehends all the virtues. Hence arose the common saying, "*Ἐν δὲ δικαιοσύνῃ συλλεγέσθην πᾶς Ἀρετὴ ἐστίν*," that is, all virtue is included in righteousness. *Particular* justice respects the *rights* of other men, and consists in the observance of equality, or in challenging no more than our own; and in giving to others what is theirs. Particular, or simple justice is either *distributive* or *commutative*. *Distributive* justice is concerned in the distribution of honour, money, or whatever else is to be divided among the members of a society, for in all these there is room for equality or inequality; and therefore to distribute as we ought is a part of justice. In other words, it is concerned in matters of government, and of beneficence; and is either remuneratory, or punitive: it observes

observes an equality in dealing rewards and punishments, according to each man's condition and merit; for as actions are either good or evil, for the good, rewards must be assigned; and for the evil, punishments; and herein a geometrical proportion is observed. *Commutative justice* superintends the management and disposal of such things as enter into compacts and agreements; or it is conversant in matters of commerce, and in the equal commutation, or changing, of things; and proceeds according to arithmetical equality, without any regard to persons and circumstances. To which we may add *legal justice*, that which resides in the state, or monarch, by whose power and authority the effects of commutative and distributive justice are frequently superseded, or suspended; as in a dearth of corn, if a person that has a stock by him will not sell it, it shall be taken from him; and the like.

Dr. More distributes justice into *ethical, economical, and political*; the first considers all mankind as on a level; the second regards them as associated into families under the several relations of husband and wife, parents and children, masters and servants; and the third comprehends them as united into public states, and obliged to certain duties, either as magistrates or people.

The precepts of justice, says the civil law, are these, *viz.* "honeste vivere, alterum non lædere, suum cuique tribuere;" that is, to live honestly, to injure no one, and to render to all their due. The two last precepts belong to strict justice, and these may accordingly furnish a distinction of justice into *negative and positive*. *Negative justice* denotes every man's right to exemption from injurious actions; and *positive justice* comprehends the performance of all those actions, which by contract, or any other way, are due to him. Some distinguish between "injuria" and "iniuria." Injustice is opposed to justice in general, whether negative or positive; an injury to negative justice alone. A person may be injured in his mind or soul, his body, his name, his relations, and his estate. (See INJURY.) *Positive justice* is the rendering to all their dues; and things may be due by a natural or an acquired right. (See RIGHT and PROPERTY.) On the subject of this article, see Grove's System of Moral Philosophy, vol. ii. and the authors to whom he refers.

JUSTICE *Hand of*. See HAND.

JUSTICE *Officers of*. See OFFICERS.

JUSTICE *Poetical*. See POETICAL.

JUSTITIAN, *Temperamentum ad*. See TEMPERAMENTUM.

JUSTICE, *Justitarius*, is likewise an officer appointed by the king or commonwealth, to do right by way of judgment.

He is called *justice*, not *judge*; anciently *justitia*, not *justitarius*, because he has his authority by deputation, as delegate to the king, and not *jure magistratus*; so that he cannot depute any other in his stead, the justice of the forest only excepted.

Of these justices we have various kinds in England; *viz.*

JUSTICE of the King's Bench, *Chief*, is the capital justice of Great Britain, and is a lord by his office. His business is chiefly to hear and determine all pleas of the crown; that is, such as concern offences against the crown, dignity, and peace of the king; as treasons, felonies, &c.

This officer was formerly not only chief justice, but also chief baron of the exchequer, and master of the court of wards. He usually sat in the king's palace, and there executed that office, formerly performed *per comitem palatii*; he determined in that palace all the differences happening between the barons and other great men.

He had the prerogative of being vicegerent of the king-

dom, whenever the king went beyond sea, and was usually chosen to that office out of the prime nobility; but his power was reduced by king Richard I. and king Edward I. His office is now divided, and his title changed from *capitalis Anglie justitarius*, to *capitalis justitarius ad placita, coram rege tenenda*, or *capitalis justitarius lanci regii*. See COURT of king's bench.

JUSTICE of the Common Pleas, *Chief*, he who, with his assistants, hears and determines all causes at the common law, that is to say, all civil causes, between common persons, as well personal as real; and he is also a lord by his office. See COURT of Common Pleas.

JUSTICE of the Forest, is a lord by his office, who has power and authority to determine offences committed in the king's forests, &c. which are not to be determined by any other court, or justice.

Of these there are two; whereof one has jurisdiction over all the forests on this side Trent, and the other beyond it.

By many ancient records, it appears to be a place of great honour and authority, and is never bestowed but on some person of great distinction. The court where this justice sits, is called the *justice seat of the forest*, held once every three years, of which 40 days' notice ought to be given, for hearing and determining all trespasses within the forest, and all claims of franchises, liberties, and privileges, and all pleas and causes whatsoever therein arising. (4 Inst. 291.) This court may fine and imprison for offences within the forest (4 Inst. 313.), it being a court of record; and therefore a writ of error lies from hence to the court of king's bench. The last court of justice seat of any note was that held in the reign of Charles I. before the earl of Holland. After the Restoration another was held, for form sake, before the earl of Oxford; but since the Revolution in 1688, the forest laws have fallen into total disuse, to the great advantage of the subject.

This is the only justice who may appoint a deputy: he is also called *justice in eyre of the forest*.

JUSTICES of Assize, were such as were wont, by special commission, to be sent into this or that county, to take assises, for the ease of the subjects.

For whereas these actions pass always by jury, so many men might not, without great damage and charge, be brought up to London; and therefore justices, for this purpose, by commissions particularly authorized, were sent down to them.

These continue to pass the circuit, by two and two, twice every year, through all England, except the four northern counties, where they go only once, dispatching their several businesses by several commissions; for they have one commission to take assises, another to deliver gaols, and another of oyer and terminer. In London and Middlesex a court of general gaol-delivery is held eight times in the year.

All the justices of peace of any county wherein the assises are held, are bound by law to attend them, or else are liable to a fine, in order to return recognizances, &c. and to assist the judges in such matters as lie within their knowledge and jurisdiction, and in which some of them have been probably concerned, by way of previous examination. See ASSISES and JURY.

JUSTICES in Eyre, *justiciarii itinerantes*, or *errantes*, were those who were anciently sent with commission into divers counties, to hear such causes especially as were termed *pleas of the crown*; and that for the ease of the subject, who must else have been hurried to the courts of Westminster if the cause were too high for the county courts.

According to some, these justices were sent once in seven years;

years; but others will have them to have been sent oftener. Camden says, they were instituted in the reign of king Henry II. A. D. 1184; but they appear to be of an older date.

They were somewhat like our justices of assize at this day; though for authority, and manner of proceeding, very different.

JUSTICES of Gaol-delivery, those commissioned to hear and determine causes appertaining to such as, for any offence, are cast into prison.

Justices of gaol-delivery are empowered by the common law to proceed upon indictments of felony, trespass, &c. and to order execution or reprieve; and they have power to discharge such prisoners as upon their trials shall be acquitted; also all such against whom on proclamation made, no evidence appears to indict; which justices of oyer and terminer, &c. may not do. (2 Hawk. 24, 25.) But these justices have nothing to do with any person, not in the custody of the prison, except in some special cases; as if some of the accomplices to a felony may be in such prison, and some of them out of it, the justices may receive an appeal against those who are out of the prison as well as those who are in it; which appeal after the trial of such prisoners, shall be removed into B. R. and process issue from them against the rest. But if those out of prison be omitted in the appeal, they can never be put into any other; because there can be but one appeal for one felony.

In this way the gaols are cleared, and all offenders tried, punished, or delivered, twice in every year.

Their commission is now turned over to the justices of assize. See *GAOL-delivery*.

JUSTICES of Nisi Prius, are now the same with justices of assize. It is a common adjournment of a cause in the common pleas, to put it off to such a day, *Nisi prius justitiarum venerint ad eas partes ad capiendas assisas*: from which clause of adjournment they are called *justices of nisi prius*, as well as *justices of assize*, on account of the writ and actions they have to deal in. See *NISI Prius*, and *JURY*.

JUSTICES of Oyer and Terminer, were justices deputed on some special occasions to hear and determine particular causes.

The commission of oyer and terminer is directed to certain persons, upon any insurrection, heinous demeanour, or trespass committed, who must first enquire, by means of the grand jury or inquest, before they are empowered to hear and determine by the help of the petit jury. It was formerly held, that no judge or other lawyer could act in the commission of oyer and terminer, or in that of gaol-delivery, within the county where he was born or inhabited; but it was thought proper by 12 Geo. II. cap. 27, to allow any man to be a justice of oyer and terminer and general gaol-delivery, within any county of England.

JUSTICES of the Peace, are persons of interest and credit, appointed by the king's commission to keep the peace of the county where they live.

Of these, some, for special respect, are made of the quorum, so as no business of importance may be dispatched without the presence, or assent, of them, or one of them. Now the practice is to advance almost all of them to that dignity, naming them all over again in the *quorum* clause except perhaps only some inconsiderable person for the sake of propriety; and no exception is now allowable, for not expressing in the form of the warrants, &c. that the justice who issued them is of the *quorum*. Whenever any justice intends to act under this commission, he sues out a writ of "*dedimus potestatem*" from the clerk of the

crown in chancery, empowering certain persons therein named, to administer the usual oaths to him; which done he is at liberty to act. Every justice of peace hath a separate power, and his office is to call before him, examine, issue warrants for apprehending, and commit to prison, all thieves, murderers, wandering rogues; those that hold conspiracies, riots, and almost all delinquents which may occasion the breach of the peace, and quiet of the subject; to commit to prison such as cannot find bail, and to see them brought forth in due time to trial; and bind over the prosecutors to the assizes. And if they neglect to certify examinations and informations to the next gaol-delivery, or do not bind over prosecutors, they shall be fined. A justice may commit a person that doth a felony in his own view, without warrant; but if on the information of another, he must make a warrant under hand and seal for that purpose. If a complaint and oath be made before a justice of goods stolen, and the informer, suspecting that they are in a particular house, shews the cause of his suspicion, the justice may grant a warrant to the constable, &c. to search in the place suspected, to seize the goods and person in whose custody they are found, and bring them before him or some other justice. The search on these warrants ought to be in the day-time, and doors may be broke open by constables to take the goods. Justices of peace may make and persuade an agreement in petty quarrels and breaches of the peace, where the king is not entitled to a fine, though they may not compound offences, or take money for making agreements. A justice hath a discretionary power of binding to the good behaviour, and may require a recognizance, with a great penalty, of one, for his keeping of the peace, where the party bound is a dangerous person, and likely to break the peace, and do much mischief; and for default of sureties, he may be committed to gaol. But a man giving security for keeping the peace in the king's bench or chancery, may have a *superseedeas* to the justices in the country not to take security; and also by giving surety of the peace to any other justice. If one make an assault upon a justice of peace, he may apprehend the offender and commit him to gaol till he finds sureties for the peace; and a justice may record a forcible entry on his own possession: in other cases he cannot judge in his own cause. Contempts against justices are punishable by indictment and fine at the sessions. Justices shall not be regularly punished for any thing done by them in sessions as judges; and if a justice be tried for any thing done in his office, he may plead the general issue, and give the special matter in evidence: and if a verdict is given for him, or the plaintiff be non-suited, he shall have double costs; and such action shall only be laid in the county where the offence was committed. (7 Jac. cap. 5. 21 Jac. cap. 12.) But if they are guilty of any misdemeanor in office, information lies against them in the king's bench, where they shall be punished by fine and imprisonment: and all persons who recover a verdict against a justice, for any wilful or malicious injury, are entitled to double costs. By 24 Geo. II. cap. 44. no writ shall be sued out against any justice of peace, for any thing done by him in the execution of his office, until notice in writing shall be delivered to him one month before the suing out of the same, containing the cause of action, &c. within which month he may tender amends; and if the tender be found sufficient, he shall have a verdict, &c. Nor shall any action be brought against a justice for any thing done in the execution of his office, unless commenced within six months after the act committed.

A justice is to exercise his authority only within the county where he is appointed by his commission, not in any city

city which is a county of itself, or town corporate, having their proper justices, &c. but in other towns and liberties he may. The power and office of justices terminate in six months after the demise of the crown (1 Ann. cap. 8.), by an express writ of discharge under the great seal, by writ of *superfedeas*, by a new commission, by the accession of the office of sheriff or coroner.

If the same justice, whose office ceases on the demise of the crown, be put in commission by the successor, he shall not be obliged to sue out a new *dedimus*, or to swear to his qualification afresh (stat. 1 Geo. III. c. 13.); nor, by reason of any new commission, to take the oaths more than once in the same reign. In case of a *superfedeas*, the power of the justices may be revived again by another writ, called a *procedendo*. Formerly it was thought, that if a man was named in any commission of the peace, and had afterwards a new dignity conferred upon him, that this determined his office; as he no longer answered the description of the commission; but now it is provided (stat. 1 Edw. VI. c. 7.), that, notwithstanding a new title of dignity, the justice on whom it is conferred, shall still continue a justice. For a further account of the duty of justices, see *QUARTER sessions*.

The original of justices of the peace is referred to the fourth year of Edward III. They were first called *conservators*, or *wardens of the peace*, elected by the county, upon a writ directed to the sheriff; but the power of appointing them was transferred by statutes from the people to the king; and under this appellation appointed by 1 Edw. III. cap. 16. Afterwards the statute of 34 Edw. III. cap. 1. gave them the power of trying felonies, and then they acquired the appellation of justices. They are appointed by the king's special commission under the great seal, the form of which was settled by all the judges, A.D. 1590; this appoints them all, jointly and severally, to keep the peace, and any two or more of them to inquire and determine felonies, and other misdemeanors; and the king may appoint as many as he shall think fit in every county in England and Wales, though they are generally made at the discretion of the lord chancellor, by the king's leave. At first the number of justices was not above two or three in a county. (18 Edw. III. cap. 2.) Then it was provided by 34 Edw. III. cap. 1. that one lord, and three or four of the most worthy men in the county, with some learned in the law, should be made justices in every county. The number, which gradually increased through the ambition of private persons, was afterwards restrained first to six, and then to eight, in every county, by 12 Ric. II. cap. 10. and 14 Ric. II. cap. 11. But their number has greatly increased since their first institution. As to their qualifications, the statutes just cited direct them to be of the best reputation and most worthy men in the county; and the stat. 13 Ric. II. cap. 7. orders them to be of the most sufficient knights, esquires, and gentlemen of the law; and by 2 Hen. V. stat. 1. cap. 4. and stat. 2. cap. 1. they must be resident in their several counties. And by 18 Hen. VI. cap. 11. no justice was to be put in commission, if he had not lands to the value of 20*l.* per annum. It is now enacted by 5 Geo. II. cap. 11. that every justice, with some exceptions, shall have 100*l.* per annum, clear of all deductions; of which he must make oath by 18 Geo. II. cap. 20. And if he acts without such qualification, he shall forfeit 100*l.* It is also provided by 5 Geo. II. that no practising attorney, solicitor, or proctor, shall be capable of acting as a justice of the peace.

JUSTICES of peace within liberties, are justices of the peace who have the same authority in cities, or other corporate towns, as the others have in counties; and their power is the same; only that these have the assise of ale and beer, wood

and victuals, &c. Justices of cities and corporations are not within the qualification act, 5 Geo. II. cap. 18.

JUSTICE-seat. See JUSTICE of the Forest.

JUSTICIA, in Botany, so named by Houston, in compliment to his countryman James Justice, esq. F. R. S. a clerk of session, said by Miller to have been a great lover and encourager of gardening and botany. He published, in 1764, an 8vo. volume, called the British Gardener's Director, but, if we are not mistaken, he deserves more honour from this fine and extensive genus, than he confers upon it.—Linn. Gen. 12. Schreb. 17. Willd. Sp. Pl. v. 1. 79. Mart. Mill. Dict. v. 2. Houtt. Rel. t. 1. Vahl. Enum. v. 1. 108. Ait. Hort. Kew. ed. 2. v. 1. 35. Brown. Prodr. Nov. Holl. v. 1. 475. Juss. 104. Lamarck. Illustr. t. 12. Gærtn. t. 54. (Adhatoda; Tourn. Inst. t. 79. Dianthera; Linn. Gen. 13. Schreb. 17. Mart. Mill. Dict. v. 2. Juss. 104. Gærtn. t. 51.)—Class and order, *Dianthria Monogynia*. Nat. Ord. *Personata*, Linn. *Acanthi*, Juss.

Gen. Ch. Cal. Perianth inferior, of one leaf, tubular, in five deep, acute, erect, equal, narrow segments. Cor. of one petal, ringent; tube swelling; limb in two very unequal lips, the upper oblong, notched, the lower in three divisions. Stam. Filaments two, awl-shaped, hidden beneath the upper lip; anthers erect, of two cells, which are sometimes more or less distant or unequal. Pist. Germen superior, turbinate; style thread-shaped, as long as the stamens, and parallel to them; stigma simple. Peric. Capsule oblong, obtuse, contracted at the base, of two cells and two elastic valves, the partition contrary to, and fixed in the middle of, each valve. Seeds two in each cell, roundish, each subtended by a spinous process.

Ess. Ch. Calyx in five deep equal segments. Corolla ringent; its lower lip three cleft. Capsule of two elastic valves and two cells; partition from the centre of each valve. Seeds two in each cell, subtended by spines.

The 14th edition of Syst. Veg. contains but 30 species of *Justicia*, and seven of *Dianthera*, which latter genus, differing only in having the two lobes of its anthers a little distant from each other, is now, by the agreement of all botanists, united to the former. Vahl, in his *Enumeratio*, has 148, including Andrews's *lucida*, v. 2. 400, Andr. Repof. t. 313, but excluding five species separated by Vahl as a genus by themselves, called *Elytraria*. Mr. Brown, who has paid more critical attention to this tribe than any botanist with whom we are acquainted, has separated from *Justicia* his own *Hypoestes* (see that article); as well as his *Nelsonia*; keeping distinct also the Linnæan *Eranthemum*, characterized by having a salver-shaped, nearly equal, corolla, which appears a very sufficient character. He suggests that the remaining supposed *Justicia* ought to be further divided, by modifications of character taken from their anthers, corolla, capsule, and even inflorescence.

We are well aware that the generic characters above given will not apply throughout to all the plants referred to this genus by Linnaeus and his followers, especially what concerns the form or divisions of the corolla. In some indeed the calyx has but four segments, instead of five, though even that mark, according to Mr. Brown, is not strictly without exception. Willdenow, though he includes *Dianthera*, has but 89 *Justicia*. Those of this author, and of Vahl, which are described with a double calyx, chiefly belong to *Hypoestes*.—*J. pulcherrima*, Linn. Suppl. 84. Vahl. n. 26. Jacq. Ic. Rar. t. 204; with *J. scabra*, Vahl. n. 27; and *crispata*, Jacq. Hort. Schoenbr. v. 3. 38. t. 320, Mr. Brown unites into a new genus, *Aphelandra*, characterized by an unequal calyx, in five deep segments, and four stamens, bearing

ing anthers of one cell each. These are very handsome shrubs, with dense spikes of long scarlet flowers; all natives of South America.

Examples of what are at present considered as *Justicia* are

J. coccinea. Aublet. Guian. v. 1. 10. t. 3. Sm. Ic. Pic. t. 8. Curt. Mag. t. 432.—Spikes terminal. Leaves and bractæ elliptical, acute. Upper lip of the corolla lanceolate, reflexed.—Native of Cayenne. A tall shrub, which flowers in our stoves in winter, but not unless it be of a considerable size. The leaves are a span long. Flowers of a rich scarlet, even more splendid than those of the *Apbellandrea* just named, which at first sight they greatly resemble. So do also those of *J. lucida* above-mentioned. See Curt. Mag. t. 1014.

J. nitida. Jacq. Amer. 5. Vahl. Enum. n. 45. Andr. Repos. t. 570.—Clusters terminal, somewhat branched. Flowers whorled. Calyx smooth. Leaves stalked, lanceolate, somewhat elliptical, pointed at each end.—Native of the West Indies. The leaves are smooth and shining. Flowers white, the under lip dotted with pink.

J. nassuta. Linn. Sp. Pl. 23. Curt. Mag. t. 325.—Leaves elliptical, entire. Flower-stalks axillary, forked. Upper lip of the corolla linear, very narrow.—Found in the East Indies. It thrives in our stoves, flowering almost all the year through. The flowers are conspicuous for their whiteness, and for the great breadth of the lower lip, whose base is dotted with crimson, while the upper is extremely narrow.

J. furcata. Jacq. Hort. Schoenbr. v. 1. 2. t. 3. Vahl. Enum. n. 89. (*J. peruviana*; Cavan. Ic. v. 1. 17. t. 28. Curt. Mag. t. 430.)—Downy. Axillary flowers sessile and nearly solitary; terminal ones ternate. Leaves ovate, or somewhat lanceolate.—Native of Peru, from whence it was brought to Spain, and from thence by the marchioness of Bute to England. It increases plentifully by seed in the stove, and is a shrubby plant, with copious not inelegant purplish flowers, whose palate is speckled with white.

J. Adhatoda. Linn. Sp. Pl. 20. Curt. Mag. t. 861.—Spikes opposite, axillary, stalked. Bractæ ovate, acute, ribbed. Corolla somewhat closed.—Native of Ceylon, an old green-house plant in Europe, and Tournefort's original species. It is commonly called the Malabar nut, a name not very appropriate. The shrub is handsome and umbrageous, with large ovate leaves. The flowers are white, their palate veined with purple, which is much concealed by their closed or ringent form. They are but rarely produced in England.

J. orchinoides. Linn. Suppl. 85. Venten. Malmais. t. 51.—Leaves sessile, lanceolate. Stalks axillary, solitary, one or two-flowered. Corolla somewhat closed.—Native of the Cape of Good Hope. It is kept in the green-house at Kew, flowering in autumn. This is a rigid shrub, with small crowded, harsh leaves. The flowers, not very unlike the last in form, are white with a reddish tinge about the palate, and grow, solitary or in pairs, on axillary stalks, longer than the leaves.

JUSTICIA, in Gardening, comprizes plants of the shrubby and herbaceous kinds, of which the species mostly cultivated are, chickweed-leaved justicia (*J. sexangularis*); the scorpion-tail Vera Cruz justicia (*J. scorpioides*); the long-spiked justicia (*J. ecboium*); the Malabar nut (*J. adhatoda*); and the snap-tree (*J. hyssopifolia*).

Method of Culture.—These plants may be increased, some of them by seeds, and the others by layers and cuttings; but the latter modes are mostly practised, as the seeds are obtained with difficulty.

Where the seeds are capable of being procured, they may be sown in small pots filled with light fresh earth, in the early spring, being plunged in a hot-bed of bark, watering the mould of the pots moderately, when it becomes dry. As they often remain long before the plants appear, the pots should not be disturbed, but be kept in the hot-bed. When the plants appear, fresh air should be admitted in mild weather, and slight waterings given; and when they have attained a few inches in growth, they should be removed into separate pots filled with fresh earth, re-plunging them in the hot-bed, watering and shading them till they have taken fresh root; air being then freely admitted, and as the season grows warm, due waterings being given. As they advance in growth, they should be placed in larger pots, taking care not to overpot them, keeping them constantly in the hot-bed.

The layers should be laid down in the early spring, in pots filled with light earth, a little water being given at the time.

The cuttings may be made from the young shoots, and planted in pots filled with the same sort of earth, in the later spring or summer months, giving them a little water, and plunging them in the hot-bed of bark in the stove, due shade being given.

When the plants have become perfectly rooted, they may be taken off, or removed into separate pots, keeping them constantly in the stove or green-house, according as they are more or less hardy. The two first sorts are the most hardy; the others succeeding best in the hot-house or stove.

The two first afford ornament and variety among the other potted plants of the less tender sorts, and the other among those of the stove kinds.

JUSTICIAR, in our *Old Laws*, an officer instituted by William the Conqueror, as the chief officer of state, and who principally determined all pleas civil and criminal. He was called in Latin *capitalis justiciarius totius Angliæ*. See *JUSTICE*.

JUSTICIARI, in *Church History*, an appellation given to heretics who boast much of perfect righteousness, and despise others; such were the Pharisees among the Jews, and the Novatians and Donatists among the Christians.

JUSTICIARIUS, *MAGISTER*, a judge in the kingdom of Naples, who has supreme jurisdiction in all cases of treason, and pleas of the crown, and finally determines all appeals. He has four assessors.

JUSTICIARY COURT, in Scotland. The court of justiciary has supreme jurisdiction in all criminal causes. It came in place of that of *justice-eyre*, or *justice-general*, which was last in the person of the earl of Argyle, who transacted for it with king Charles I. and was made justice general of all the islands; which raising great debates between him and some hereditary sheriffs there, the jurisdiction was taken away in 1672, and this court of justiciary erected instead of it, consisting of a justice-general, alterable at the king's pleasure; a justice-clerk and five other judges, who are likewise lords of the session.

This court commonly sits on Mondays, and has an ordinary clerk, who has his commission from the justice-clerk. They have four ordinary macers and a doomster appointed by the lords of the session.

The form of process is this; the clerk raises a libel or indictment, by a bill passed by any of the lords of that court, at the instance of the pursuer against the defender or criminal, who is committed to prison immediately after citation. When the party, witnesses, and great assise, or jury of forty-

five men, are cited, the day of appearance being come, fifteen of the great assise are chosen to be the assise upon the pannel, or prisoner at the bar. The assise sits with the judges to hear the libel read, witnesses examined, and the debates on both sides, which is written verbatim in the adjournal books. The king's advocate pleads for the pursuer, being the king's cause, and other advocates for the panel. The debates being closed, the judges find the libel or indictment either *not relevant*; in which case they desert the diet, and assioil or absolve the party accused; or else they find the libel *relevant*; in which case the assise or jury of fifteen is removed into a close room, none being allowed to be present with them; where they choose their own chancellor and clerk, and consider the libel, depositions, and debates, and bring in their verdict of the panel sealed, guilty or not guilty. If not guilty, the lords absolve; if guilty they condemn, and order the sentence of condemnation to be pronounced against the criminal by the mouth of the doomster. It has been strenuously maintained by some, and as strenuously controverted by others, that an appeal lies from this court to the house of lords. The lords of justiciary likewise go circuits twice a year, *viz.* in May and October, into the country, which is divided into three circuits, the south-west, and north, where assises are held, and criminals tried, as mentioned above.

JUSTICES, in *Law*, a writ directed to the sheriff in some special cases, by virtue of which he may hold plea of debt in his county-court for a large sum; whereas otherwise, by his ordinary power, he is limited to sums under forty shillings. The freeholders of the county are the real judges in this court, and the sheriff is the ministerial officer.

JUSTIFIABLE HOMICIDE. See **HOMICIDE**.

JUSTIFICATION, in *Law*, a special plea in bar, which signifies a maintaining or shewing a sufficient reason in court, why the defendant did what he is called to answer. Pleas in justification must set forth some special matter: thus, on being sued for a trespass, a person may justify it by proving that the land is his own freehold; that he entered a house in order to apprehend a felon; or by virtue of a warrant, to levy a forfeiture, or in order to take a distress; in an assault, that he did it out of necessity; and, in an action of slander, that the plaintiff is really as bad a man as the defendant said he was.

JUSTIFICATION, or *Justifying*, among *Letter Founders*. See **Letter Foundry**.

Among *Printers*, it denotes the proper adjustment of the lines and pages.

JUSTIFICATION, in *Theology*, that act of grace which renders a man just or righteous in the sight of God, and places him in a state of salvation.

The Romanists and reformed are extremely divided about the doctrine of justification; the latter contending for justification by faith alone, and the former by good works.

In the 11th article of the church of England it is declared that "We are accounted righteous before God, only for the merit of our Lord and Saviour Jesus Christ, by faith, &c." By the faith, which in several passages of scripture is said to justify and save, says a commentator on the thirty-nine articles (see *Elem. of Christian Theology*, by the lord bishop of Lincoln) we are to understand that lively "faith which worketh by love;" which purifieth the heart, and which keepeth the commandments of God: But though by these acts of obedience we demonstrate that we truly and firmly believe the divine authority of Christ and his doctrines, yet this faith is not so meritorious in its own nature as to entitle us to the reward of eternal life: it justifies us only by being the

condition upon which it has pleased our Almighty Father to offer us salvation. Our justification is not to be attributed to the inherent efficacy of faith, but to the mercy of God, and merits of Christ, from which that efficacy is derived. On the contrary, the Papists assert, that men's inherent righteousness is the meritorious cause of their justification, and that good works "ad vitam æternam consequendam verè promereri." (Cave. *Trid. de Bon. Op. c. 12.*) Some other divines maintain, that as, on the one hand, our sins were imputed to Christ, so on the other, we are justified by the imputation of Christ's righteousness to us; *i. e.* we, though guilty, on complying with the gospel, are finally treated by God as righteous persons (*i. e.* as if we had never offended him at all, or had ourselves satisfied the demands of his law for such offences), out of regard to what Christ has done or suffered, whereas we should not otherwise have been so treated. Others again, who disapprove both the term imputation and the sentiment which it implies, represent faith in Christ and the gospel as the principle or spring of those virtues or of that character which renders men fit objects of mercy, and of those promises of pardon, favour, and eternal life, which flow originally from the grace of God, and which are communicated to mankind by the mediation of Jesus Christ. For the manner in which the doctrines of St. Paul and of St. James, with regard to justification, are rendered consistent with each other, see the article **FAITH**. Dr. Whitby represents faith as consisting merely in an assent to the gospel as true; and says, that upon declaring that assent, a man was justified from all past sins, without good works; but that good works were necessary in order to *continue* in a justified state. A notion much resembling this has been advanced and largely illustrated by Dr. Taylor, in his "Key to the Apostolical Writings," prefixed to his Commentary on the epistle to the Romans, and included in a "Collection of Tracts," published by Dr. Watson, bishop of Landaff, for the use of students in the universities, and the younger clergy. (See **FAITH**.) This learned divine endeavours to establish a "double justification," or salvation, for which, he thinks, we have the clearest scriptural evidence. The *first*, or fundamental justification, relates to the heathen state of us gentile Christians, and consists in the remission of sins, and in our being admitted, upon our faith, into the kingdom and covenant of God; when, with regard to our gentile state, we were obnoxious to wrath, and deserving of condemnation. This is of "free grace, without works." For how wicked soever any Heathen had been, or *now* has been, upon profession of faith in Christ, his former wickedness neither was, nor is, any bar to his admittance into the kingdom of God, nor to an interest in its privileges and blessings. Nay further, our present common salvation, or justification, is so of grace, and reaches so far, that in case any professed Christian has lived disagreeably to the rules of the gospel; yet, upon his repentance and return to God, his interest in the divine grace and the pardon of sin stands good, notwithstanding his former evil life. This our author calls the "first justification," or salvation, by which we are invested in all the present privileges of the gospel; and in reference to which we are said in scripture to be *cleansed, adopted, saved, justified, washed, sanctified, born again, born of God, &c.* The first justification, however, does not terminate in itself, but is in order to another, which we may call "*final* justification," or salvation. This relates to, and supposes our Christian state; and consists in our being actually qualified for, and being put in possession of, eternal life, after we have duly improved our *first* justification, or our Christian privileges, by patient continuance in well-doing, to the end, under all trials and temptation. By *works*, says our author,

excluded by St. Paul from justification or salvation, he doth not mean any *ceremonial* works, or *ritual* observances of the Mosaic constitution (see Titus, iii. 5.); but all acts of obedience properly *moral*. Moreover, by *works*, or *works of law*, excluded from justification, the apostle doth not always mean only sinless, perfect obedience. The *works* excluded from justification are any kind of obedience, perfect or imperfect, which may be supposed a reason for God's bestowing the privileges and honours of the gospel upon the heathen world. Those privileges and honours were bestowed out of pure mercy and goodness, without regard to the foregoing good or bad works of the heathen world. The *works*, which are excluded from justification, refer to the prior state of Christians, and to their *first* justification; when they were taken into the church or kingdom of God, and had their *past sins* forgiven them. This *first* justification was not of works, it was of mere grace, according to the counsel and purpose of God's own will, without regard to what the Heathen had been before his conversion. But after conversion, when a man is become a Christian, and with regard to *final* justification, works are expressly required. Nevertheless, works of righteousness are so insisted upon in our Christian state, now that we are taken into the kingdom of God, that if any Christian should neglect the performance of them, there is still room, in *this life*, for repentance. For our Lord and his apostles not only called men to repentance, in order to their *first* justification; but the apostles, and our Lord after his ascension, exhort wicked Christians, such as were members of the gospel church, to repentance, in order to their *final* justification. 2 Cor. xii. 21. Rev. ii. 5, 16. iii. 3, 19.

JUSTIFYING BAIL, in *Law*. See BAIL *above*.

JUSTIFYING Grace. See GRACE.

JUSTIN I., in *Biography*, emperor of the East, a native of Dacia, was born about the year 450, and was brought up to the mean occupation of keeping of cattle. Possessing a strength and stature which he thought were likely to recommend him, he left the business of a pastoral life, and obtained a place among the guards of the emperor Leo. He rose by degrees in the service, till at length, in 518, he possessed, at the death of Anastasius, the important office of prefect-prætorio; and by the application of timely bribes, he stepped on to the vacant throne, and apparently with the unanimous consent of the military, the clergy, and the people. The eunuch Amantius, who would gladly have raised one of his own friends to the high office, was, for a real or pretended conspiracy, with some of his associates, punished with exile or death. The Gothic chief Vitalian, who had revolted against Anastasius, and remained at the head of a powerful army, was decoyed into the palace, and assassinated at a royal banquet. Justin, to whom the epithet of *elder* is given, to distinguish him from another emperor of the same name and family, was sixty-eight years of age when he was invested with the imperial purple; and though without any advantages of education, he was preserved from exposing his incapacity, by his good sense in following the direction of able statesmen, whom he had the discernment to select, and the wisdom to confide in. At this time, says the historian, the world beheld two contemporary monarchs, Theodoric and himself, who were even destitute of the knowledge of the alphabet: but the commanding genius of the Goth rendered him respectable amidst all his ignorance; and Justin, conscious of his deficiencies, relied on the diligence of his questor Proclus, and the talents of his nephew Justinian, whom the emperor had brought from the solitudes of Dacia, and educated as his future heir. The chief events of this reign were the persecution of the Arians, advances

towards a reconciliation with the Roman see, and the commencement of a war with the king of Persia. He associated Justinian as his colleague in the empire in 527, and soon after died, in the ninth year of his reign. An earthquake, which almost ruined Antioch and several other cities in the East, was a calamity which greatly affected the emperor. He is said to have laid aside the imperial robes, clothed himself in sackcloth, and passed several days in fasting and prayer, to avoid the divine judgments. His piety was not surpassed by his humanity; and he displayed much benevolence in relieving those who had suffered by and survived the terrible disaster. Gibbon. Univer. Hist.

JUSTIN II., emperor of the East, nephew and successor of Justinian, ascended the throne in 565. The choice of the senate and people was sanctified by the benediction of the patriarch, who placed the diadem on his head, which was the first time the ceremony had been performed by a priest. As his predecessor had given great offence by abolishing the office of consul, the new emperor restored it in his own person, almost as soon as he came to the throne. On this occasion, he distributed large sums of money among the people, and immediately discharged the debts, and corrected the abuses of his late uncle. The popularity acquired by this commencement of Justin's reign was soon forfeited by instances of cruelty and avarice, which were imputed to the instigation of the empress Sophia. He caused his relation Justin, who had a military command on the banks of the Danube, to be strangled; and he put to death some of his senators, from a suspicion of their being disaffected. He made war against Persia; but being defeated at the head of a numerous army, he was obliged to sue for peace. Soon after this, Justin was seized with a disorder, which affected his intellects, and rendered him incapable of government. By the advice of his empress, he raised to the rank of Cæsar, in the year 574, a Thracian named Tiberius, who had obtained, by his abilities, the office of post-captain of the guards. The ceremony of his elevation was performed in the portico of the palace, in the presence of the patriarch and the senate. On this occasion Justin made a long speech, which his flatterers imputed to divine inspiration, in which he recommended his successor to love his people as himself; to cultivate the affections, and maintain the discipline of the army; to protect the fortunes of the rich, and to relieve the necessities of the poor: and he concluded with a prayer, that the God of heaven and earth would infuse into his heart to do whatever he himself had neglected or forgotten. The four last years of his life were spent in retirement; and his choice was justified by the filial reverence and gratitude of Tiberius. Justin died October 5th, 578.

JUSTIN, a Latin historian, is supposed to have flourished in the second century, under Antoninus Pius. His history, which is used in our schools as an elegant compendium for young people, is an abridgment of that of Trogus Pompeius, in forty-four books, which has been long lost. The narration of Justin is clear, his reflections are sensible, though obvious, and his style is sometimes eloquent. The history comprehends what relates to the Assyrian, Persian, Grecian, Macedonian, and Roman empires. The best editions are those by Gronovius, Hearne, and Barbou. The Delphin edition is much in use.

JUSTIN, *St.*, in *Geography*, a town of France, in the department of the Landes; 27 miles W. of Condom.

JUSTINGEN, a town and capital of a lordship, purchased in 1751 by the duke of Wirtemberg; 16 miles N.E. of Buchau.

JUSTINIAN I., in *Biography*, emperor of the East,

was born of an obscure race in Dacia, whence, as we have seen in the article *JUSTIN I.*, he was brought, and educated with a view of succeeding to the empire. Justinian was, during the life of his uncle, made partner in the imperial throne; and upon the death of Justin, became its sole possessor, being at that period, A.D. 527, in the forty-fifth year of his age. Immediately upon his elevation, he solemnly espoused Theodora, an actress, who in early youth had followed a course of prostitution, and who gained so complete an ascendancy over the mind of the emperor, as to be associated with him on the throne. He began his reign by a violent persecution of heretics and sectaries, and he regarded himself as a great theologian. His reign was, however, memorable for many important transactions, military and civil; and he carried his arms with success against his enemies, for which he was chiefly indebted to Belisarius his great general, who also preserved him from a formidable conspiracy. (See the article *BELISARIUS*.) The legislative labours of Justinian are what have conferred the chief celebrity on his name. The reformation of the Roman jurisprudence occupied the attention of the emperor from his first possession of the supreme power. The person to whom he principally confided this arduous task was Tribonian, an eminent lawyer of various and extensive attainments. By his cares, and those of nine persons associated with him, the new code of Justinian was completed in the year 529. This publication was followed in 533 by that of the *Pandects* or *Digest*, a compilation of the decisions and opinions of former civilians; and of the *Institutes*, an elementary treatise of the Roman law for the use of students. A new edition of the Code, in 534, made a considerable addition to the emperor's own laws; and his *Edicts* and *Novels* complete the vast edifice of jurisprudence, reared by the legislative spirit which distinguished his reign. Another remarkable trait in this emperor's character was his passion for building. His piety was displayed in numerous churches, and other buildings dedicated to religion, of which the celebrated church of *Sancta Sophia* at Constantinople, now subsisting as the principal mosque of the Turkish empire, attests the magnificence of his designs. Bridges, aqueducts, high-roads, and hospitals, were among his works of public utility, by which every province of the empire was benefited. His works of peace were frequently interrupted by wars, which agitated the empire during almost the whole of this reign; but in 558, a peace upon honourable terms put an end to the long contests between the Roman and Persian empires. The rejoicings on this event were disturbed by a dreadful earthquake, which overthrew many stately edifices, with a great loss of lives. Justinian, broken down with cares and old age, died in November 565, in the thirty-ninth year of his reign, and the eighty-third of his age. Among other distinguished events of this reign, the introduction of the silk-worm into the Greek empire, by means of two Persian monks, who went as missionaries to China, ought not to be omitted. The increasing jealousies, and the heavy burdens which Justinian imposed upon his subjects, had, some time before his death, destroyed all attachment to his person; and he who, in many respects, deserved the title of the last Roman emperor, left the stage unlamented and unhonoured. Gibbon. *Univer. Hist.*

JUSTINIAN II., emperor of the East, succeeded his father *Constantine Pogonatus* in 685, being then only sixteen years of age. He was naturally of a violent temper; and his love of war induced him to break a treaty which he had made with the Saracens, and renew hostilities against them. He recovered several provinces from his enemies, and made an extravagant peace with them; but his exactions, cruelties,

and debaucheries, tarnished the glory of his arms, and rendered him an object of hatred to all. He formed a design of destroying all the inhabitants of Constantinople: but *Leontius*, a celebrated commander, attempted the deliverance of his country. He was successful; dethroned the emperor, and seized him and his ministers without resistance. Justinian's life was spared, but he was sentenced to be banished, and to suffer the amputation of his nose: hence he was named by the Greeks "*Rhinotmetus*." In 704 he, by the assistance of the Bulgarians, regained his seat, when he revenged himself upon his enemies. The first victims were *Leontius* and *Tiberius*, who had successively filled the throne during the interval of his banishment. These were dragged in triumph through the city, and then placed in chains beneath his throne, whence he beheld the spectacles, with a foot upon each of their necks, whilst the inconstant people shouted, "Thou shalt trample on the asp and basilisk." They were then led to execution. So many persons were, on this occasion, the victims of his fury, that it is said whole provinces were almost depopulated by the multitude of his executions. Justinian died by the hands of assassins in 711; and such was the hatred which he had every where inspired, that his young son *Tiberius*, whom his grandmother had placed in a sanctuary, was dragged from the altar, and murdered before her eyes. Thus the race of *Heraclius* was extinguished, after a reign of one hundred years. *Univer. Hist.* Gibbon.

JUSTIZA, a magistrate of Arragon, whose office bore some resemblance to that of the *ephor* in ancient Sparta. He acted as the guardian of the people, and the comptroller of the prince. His person was sacred, and his jurisdiction unbounded. He was the supreme interpreter of the laws. Not only inferior judges, but the kings themselves, were bound to consult him in every doubtful case, and to receive his responses with implicit deference. An appeal lay to him from the royal judges, as well as from those appointed by the barons within their respective territories. Even when no appeal was made to him, he could interpose by his own authority, prohibit the ordinary judge to proceed, take immediate cognizance of the cause himself, and remove the party accused to the "*Manifestation*," or prison of the state, to which no person had access but by his permission. His power was exerted with no less vigour and effect in superintending the administration of government, than in regulating the course of justice. It was his prerogative to inspect the conduct of the king, to review all the royal proclamations and patents, and to declare whether or not they were agreeable to the law, and fit to be executed. He, by his sole authority, could exclude any of the king's ministers from the conduct of affairs, and call them to answer for their mal-administration. The justiza himself was accountable only to the Cortes for the execution of his high office. By a law enacted in the Cortes, A.D. 1442, it was ordained that the justiza should continue in office during life, and should not be removed from it, unless by the authority of the Cortes. This officer was appointed by the king; but to prevent his becoming a dependent and tool of the crown, instead of the guardian of the people, it was determined that he should retain his office during life. He was selected from persons of the second class, or *cavalleros*, answering nearly to gentlemen or commoners in Great Britain, and not from the *ricosombres* or noblemen, that he might check the domineering and oppressive spirit of the nobles, as well as set bounds to the power of the monarch; and that he himself might be accountable for the manner in which he executed his trust, and liable to rigorous punishment: whereas the *ricosombres* were not subject to capital punishment.

ment. For contracting his power, seventeen persons were chosen by lot in each meeting of the Cortes; and these formed a tribunal, called the court of inquisition into the office of justiza. This court met at three stated times in the year; and to this court the justiza and his deputies were responsible for their conduct. The members of the court passed sentence by ballot; and they might punish by degradation, confiscation of goods, or even with death. The law which erected this court, and regulated the forms of its proceedings, was enacted A.D. 1461. Robertson's Hist. of Charles V., vol. i.

JUSTNESS, the exactness or regularity of any thing. Justness is chiefly used in speaking of thought, language, and sentiments. The justness of a thought consists in a certain precision or accuracy, by which every part of it is perfectly true, and pertinent to the subject.

Justness of language consists in using proper and well chosen terms; in not laying either too much, or too little.

M. De Mere, who has written on justness of mind, distinguishes two kinds of justness; the one arising from taste and genius; the other from good sense, or right reason. There are no certain rules to be laid down, for the former, viz. to shew the beauty and exactness in the turn, or choice of a thought; the latter consists in the just relation which things have to one another.

JUTE, in *Manufactures*, is a remarkably strong vegetable fibre, the produce of the East Indies, which Dr. William Roxburgh has fully described, and its uses, in the Transactions of the Society of Arts, vol. xxii. p. 372.

JUTERBOCK, in *Geography*, a town of Germany, in the principality of Quersfurt, with two faubourgs, situated on the Angerbach; 16 miles N. E. of Wittenburg. N. lat. 52°. E. long. 13° 2'.

JUTES, in *Ancient History*, a tribe of the Getæ, the conquerors of so many countries, inhabited the extremity of the Cimbric Chersonesus, which from them is still called *Jutland*; which see.

JUTHIA, **ODIA**, or *Siam*, in *Geography*, a town of Asia, capital of the kingdom of Siam, and residence of the king, situated on a large island in the river Menan, at the distance of some leagues from the sea. The royal palace is large and beautiful, and the pagodas are numerous. The Dutch have a factory here, and many merchants from different countries come to trade. In 1766, this town was taken by the Birmans. N. lat. 14° 18'. E. long. 100° 52'.

JUTLAND, a peninsula of Europe, in the kingdom of Denmark, formerly called "Cimbria," and the "Chersonesus Cimbricus," bounded on the E. by the Seaggarak, the Little Belt, and the Baltic; on the S. by the duchy of Holstein, and on the W. and N. by the Northern sea; about 200 miles long, and 95 broad. It is generally divided into North Jutland, more especially called *Jutland*, and South Jutland, more generally called the "duchy of Sleswick;" which see.

JUTLAND, or *North Jutland*, is bounded on all sides by the sea, except towards the south, where its boundary is the duchy of Sleswick; it is about 150 miles long, and from 60 to 80 broad. Of all the territories belonging to Denmark, it is the largest and yields the greatest revenue. The middle part consists of heaths and moors, intermixed with few spots of arable land; but these afford good pasture for oxen, sheep, and goats. The other parts, of greater extent, are very fertile, and yield a great quantity of grain, which is annually exported to Sweden, Norway, and Holland. The inhabitants derive also considerable sums from their oxen, horses, and hogs. Hence Jutland is commonly called "the land of bacon and rye bread." This country

is also plentifully supplied with all kinds of fresh water and sea fish. On the east side it has fine woods of oak, beech, fir, &c. but on the west side the inhabitants are obliged to use heath and turf for fuel. Jutland abounds with game. The air is keen and cold, especially towards the North sea. The inhabitants are vigorous, robust, and resolute; and seem to have gained a greater degree of freedom than the other inhabitants of Denmark. Many of the Jutlanders have freeholds, for which they pay a small acknowledgment to the lord of the manor and the public taxes. The Danish language is spoken in Jutland with a particular accent, and with less purity than in the other provinces. The only place in which the exercise of any religion, besides Lutheranism, is tolerated, is Fredericia. North Jutland is composed of four dioceses, or governments; each of which has its bishop and general-governor; and they derive their names from those of their chief cities, viz. Aalborg, Wiborg, Arrhuus, and Ripen. The population of these four dioceses is stated by Mr. Coxe at 358,136 persons. Jutland supplies tripoly and fuller's earth, besides some alum and vitriol.

JUTRAM, a town of Hindoostan, in Guzerat, on the gulf of Cambay; 16 miles N.W. of Amood.

JUTTARA, a town of Hindoostan, in the circle of Cieacole; 10 miles N. of Visigapatam.

JUTTY HEAD. See *JETTY Head*.

JUTWAR, in *Geography*, a small circle of Hindoostan, in Guzerat, on the left bank of the Puddar, a little above the gulf of Cutch; about 25 miles long, and 16 broad.

JUVANTIA, in *Medicine*, literally signifying *aiding* things, and generally contrasted with *ludentia*, or *hurtful* things, is a term applicable to every agent or circumstance which contributes to alleviate a disease, as the word *ludentia* signifies every thing which can increase the symptoms of a disorder, or prevent its progress towards amendment; but the terms are principally used to denote those things, which possess a minor degree of influence on the animal economy, and cannot be classed among the actual remedies or causes of disease. Whence the common precept of medical writers, to attend to the *juvantia* and *ludentia*, at the same time that the active remedies for any disease are employed.

JUVELSKOI, in *Geography*, a town of Russia, in the government of Tobolsk. N. lat. 63° 40'. E. long. 61° 14'.

JUVENAL, **DECIUS JUNIUS JUVENALIS**, in *Biography*, a celebrated Roman poet, who was born at Aquinum, in Italy. He came early to Rome, and passed much of his life in the pursuits of the bar, after which he applied himself to write satires, sixteen of which are still extant, and very highly prized. They stand pre-eminent in the class of those which employ warm serious invective, and make vice rather than folly their object. He wrote with acrimony against all his adversaries: he is far more correct than his contemporaries, which has been attributed to his judgment and experience, being far advanced in life when he wrote his satires. He appears to have been a lover of virtue, though his language and descriptions are sometimes very gross: many of his maxims of morality are delivered with great force and dignity; as a poet he has more animation than taste. He has with reason been called the last of the Roman poets, for after him poetry decayed, and nothing more claims attention as a perfect poetical composition. The best editions of this poet are those by Casaubon, of Hawkey, and of Grævius cum notis variorum. The Delphin edition is much used, as are the Aldine and Glasgow editions.

JUVENALIA, or *JUVENALES ludi*, games, exercises of body, and combats, instituted by Nero the first time his beard was shaved.

They

They were celebrated in private houses, and even the women had a share in them: probably they were the same with what were otherwise called *Neroniana*.

JUVENCUS, **CAIUS VETTIUS AQUILINUS**, in *Biography*, one of the earliest Christian poets, was a priest of a noble family in Spain, and flourished in the fourth century. He wrote a poem on the life of Christ, taken from the gospel of St. Matthew. It was composed about the year 329. It has been frequently reprinted, and may be found in Maittaire's "Corpus Poetarum;" and in the "Bibliothèque des Pères." Gen. Biog.

JUVENIEC, in *Geography*, a town of Poland, in the palatinate of Wilna; 70 miles E. of Lida.

JUVENTAS, in *Mythology*, the goddess who presided over youth among the Romans. This goddess was long honoured in the Capitol, where Servius Tullius erected her statue. Near the chapel of Minerva there was the altar of Juventas, and upon this altar a picture of Proserpine. The Greeks called the goddess of youth Hebe; but it has been generally supposed that this was not the same with the Roman Juventas.

JUVIGNY, in *Geography*, a town of France, in the department of the Channel, and chief place of a canton, in the district of Mortain; four miles N. W. of Mortain. The place contains 632, and the canton 5603 inhabitants, on a territory of 100 kilometres, in nine communes. Also, a town of France, in the department of the Marne; nine miles N. W. of Chalons-sur-Marne.—Also, a town of France, in the department of the Orne, and chief place of a canton, in the district of Domfront. The place contains 1945, and the canton 11,126 inhabitants, on a territory of 207½ kilometres, in 13 communes.

IVY, in *Botany*, &c. (See **HEDERA**.) The ivy is a small well-known creeping or climbing kind of plant. From its property of spreading rapidly over a surface, it has been recommended as proper for protecting the faces of earthen dikes, and other similar fences, as by this means they are preserved from mouldering down and being destroyed.

IVY, in the *Materia Medica*. The leaves of ivy are seldom used inwardly, but outwardly they are applied to issues, to keep them cool, and free from inflammation, as also to scabs, sores, and scald heads. Mr. Boyle, in his use of Experimental Philosophy, commends a large dose of the full ripe berries as a remedy against the plague; and it is said, that in the London plague, the powder of them was given in vinegar, or white wine, with success; and they have been recommended in small doses, as alexipharmic and sudorific. Schroder says, they purge upward and downward. The gum of ivy is somewhat caustic, and commended to take away spots and freckles out of the face. This resinous juice, exuding from the stalks of ivy, has been recommended as corroborant and resolvent, in cachexies and uterine obstructions; but has been rarely used, except as an ingredient in plasters; nor does it appear to possess any virtues which common resin has not in an equal degree.

Ivy-resin is brought from Persia, and some other of the hot countries, where alone it is to be found in any considerable quantity. Mr. Ray, indeed, mentions some of it having been found on ivies in Worcestershire, and other authors in other parts of Europe; but these are only singular instances of what may happen, our shops being obliged to be supplied from the East.

The ancient Greeks were acquainted with this resin, which they called *lachryma hederae*, as some also do to this day. It is said to be emollient and detergent, and to make

a noble balsam for fresh wounds; but is never used by us with these intentions. The Persians esteem it much as an astringent.

IVY, *Ground*, in *Botany* and the *Materia Medica*. See **GLECHOMA**.

IVY-tree of America. See **KALMIA**.

IVY, *Petrified*. See **PETRIFICATION**.

IVY, *Virginian*. See **MOONSEED**.

JUXON, **WILLIAM**, in *Biography*, was born at Chichester, but received his education at Merchant Taylors' school, London, from whence he was removed to St. John's college, Oxford, of which he was made a fellow in 1598, and in 1621, he was elected president. In 1627, he was promoted to the deanery of Worcester, and in 1633, appointed clerk of the closet to the king, and in the following year he obtained, through the interest of archbishop Laud, the bishopric of London; and shortly after he was appointed lord high treasurer. This last promotion gave general offence. His birth and character were deemed too obscure for a man raised to one of the highest offices of the crown; nevertheless, his conduct in that station was irreproachable. In the rebellion he suffered the loss, not only of his ecclesiastical revenues, but of a great part of his temporal estate. In 1648, he attended the king upon the scaffold, after which he was taken into custody with a view of forcing him to reveal any secrets with which his majesty had entrusted him; but his prudence, integrity, and honour, were superior to every art exercised upon him. At the restoration he was made archbishop of Canterbury. He died in 1663, at the age of 81, and was buried in St. John's college-chapel, Oxford. He was a person of great integrity, mildness, and humanity, and endowed with an excellent understanding. Wood. Hume.

JUXTAPOSITION, is used by philosophers to denote that species of growth, which is performed by the apposition of new matter to the surface, or outside, of old.

In which sense, it stands opposed to intussusception; where the growth of a body is performed by the reception of a juice within it, diffused through its canals. See **NUTRITION**.

JUZCUR, in *Geography*, a town of Africa, in the kingdom of Fez, on the coast of the Mediterranean; 15 miles W. of Mezemba.

JUZENNECOURT, a town of France, in the department of the Upper Marne, and chief place of a canton, in the district of Chaumont; six miles N. W. of Chaumont. The place contains 243, and the canton 6435 inhabitants, on a territory of 272½ kilometres, in 24 communes.

IWAMI, or **SEKISU**, a province of Japan.

IWANCZOWICZA, a town of Lithuania, in the palatinate of Novogrodek; 52 miles S. S. W. of Novogrodek.

IWANGROD, a town of Poland, in the palatinate of Bracław; 60 miles E. S. E. of Bracław.

IWATA, a town of Japan, in the island of Nippon; 100 miles W. of Jedo.

IWETPOUR, a town of Bengal; 15 miles E. of Gogragot.

IWIE, a town of Lithuania, in the palatinate of Wilna; 24 miles E. of Lida.

IWNICA, a town of Poland, in the palatinate of Kiev; 60 miles W S W of Kiev.

IXIA, in *Botany*, *ixis*, the Greek name of the Mistletoe, or *Viscum album*. It does not appear why Linnæus adopted it for the present genus.—Linn. Gen. 26. Schreb. 35. Willd. Sp. Pl. v. 1. 195. Vahl. Enum. v. 2. 49. Thunb. Diss. n. 8. Ait. Hort. Kew. ed. 2. v. 1. 86. Ker. in Ann. of Bot. v. 1. 226. Curt. Mag. p. 1013. Mart. Mill. Dict.

v. 2. Juss. 58. Lamarck. Illustr. t. 31.—Class and order, *Triandria Monogynia*. Nat. Ord. *Enfatae*, Linn. *Irides*, Juss.

Gen. Ch. *Cal.* Spatha inferior, shorter than the corolla, of two oblong permanent valves; the outermost enfolding the inner one. *Cor.* of one petal, superior; tube thread-shaped, slender, erect, scarcely dilated upwards; limb regular, divided to its very base into six, nearly equal, spreading, flattish segments. *Stam.* Filaments three, inserted into the mouth of the tube, decurrent, much shorter than the limb; anthers oblong, somewhat curved. *Pist.* Germen roundish, somewhat triangular; style thread-shaped, erect; stigmas three, linear, recurved, spreading. *Peric.* Capsule roundish-ovate, membranous, tumid, of three cells and three valves. *Seeds* numerous, globose.

Ess. Ch. Spatha of two valves. Corolla with a slender tube, and regular limb. Stigmas three, narrow, recurved. Capsule ovate, somewhat globose. Seeds globose.

An extensive genus of bulbous Cape plants in Linnæus, Willdenow, and Vahl, from which Mr. Ker has, generally we think very happily, separated several genera, all agreeing with it in the regular corolla, by which they are all in common distinguished from *Gladiolus* (see that article); but differing from it, as well as among themselves, in other particulars. See *ARISTEA*, *GEISSORRHIZA*, and *HESPERANTHA*.—As we have given a view of all the certain species of *Gladiolus*, we deem it necessary to do the same by *Ixia*, of which Mr. Ker reckons up 15 species. In its old state the genus stands in Willdenow with 47 species, and in Vahl with 56, besides six reckoned by the latter doubtful, adopted from Burmann.

Section 1. *Limb less spreading, tube shorter, spatha larger, as well as more thin and membranous, than in the rest.*

1. *I. pendula*. Thunb. Diff. n. 16. Linn. Suppl. 91.—Flowers somewhat bell-shaped, pendulous. Branches of the panicle capillary, drooping. Spatha longer than the tube.—Gathered at the Cape of Good Hope, in watery places, in November, by Thunberg, who describes it as the tallest and most ornamental of its genus, with large, pendulous, flesh-coloured flowers, the segments of which, in his specimen given to Linnæus, are above an inch long, while the tube is not half so much. We know no figure of this species, nor is it in the gardens.

2. *I. capillaris*. Thunb. n. 12. t. 2. f. 2. Linn. Suppl. 92. Ker in Curt. Mag. t. 573? Flowers somewhat bell-shaped. Spatha equal to the tube. Leaves linear.—Native, like all the rest, of the Cape of Good Hope, flowering in our green-houses chiefly in the spring. Mr. Ker quotes under this *I. lancea*, Jacq. Ic. Rar. t. 281. If this be right, it varies in the breadth of its leaves, as well as in having sometimes only one flower on a stalk, sometimes several. They are of a pale rose or flesh colour. The bulb is curiously reticulated.

3. *I. aulica*. Ait. Hort. Kew. ed. 1. v. 1. 57. ed. 2. v. 1. 86. (*I. capillaris* γ; Ker in Curt. Mag. t. 1013.)—Flowers nearly salver-shaped, crowded. Spatha half as long as the tube. Leaves oblong, many-ribbed.—Sent by Mr. Masson to Kew garden in 1774. Mr. Ker esteems it a variety of the preceding, but the characters we have given seem to distinguish it. The flowers are much more expanded, and larger, of a full rose-colour, and the leaves very much broader.

Section 2. *Tube slender, considerably longer than the spatha; limb widely spreading.*

4. *I. aristata*. Thunb. Diff. n. 15. Ker in Curt. Mag. t. 589.—Spike somewhat level-topped. Spatha about one-fourth the length of the tube, sharply toothed. Limb salver-shaped. Stamens nearly equal to the style.—The leaves

are broad and sword-shaped, with many ribs, and a cartilaginous though narrow edge. *Stem* round, sometimes branched. *Flowers* numerous, somewhat corymbose, rose-coloured with a white orifice, inodorous, their limb quite flat. The *spatha* has much of the character of Mr. Ker's genus *Sparraxis*. This species requires a constant supply of water, especially when about flowering.

5. *I. patens*. Ait. Hort. Kew. ed. 1. v. 1. 59. ed. 2. v. 1. 86. Ker in Curt. Mag. t. 522. Redout. Liliac. t. 140. (*I. filiformis*; Venten. Jard. de Cels, t. 48. Redout. Liliac. t. 30. *I. aristata*; Schneev. Ic. t. 32.)—Spike cylindrical. Tube very slender; limb widely spreading, somewhat reflexed. Filaments erect and close together.—The leaves of this very handsome species are sword-shaped. *Stem* slender, erect and rigid. *Flowers* more or less numerous, in a cylindrical spike, rarely branched, their colour a vivid crimson or carmine, sometimes varying to a lighter vermilion hue. The segments of the limb are often much reflexed, and they vary in length, but are usually elliptical, and each near an inch long. The eye, or orifice of the tube, is often green bordered with white.

6. *I. flexuosa*. Linn. Sp. Pl. 51. Ker in Curt. Mag. t. 624. (*I. polytachya*; Redout. Liliac. t. 126. *I. capitata*, var. *stellata*; Andr. Repof. t. 232.)—β. *I. flexuosa*; Curt. Mag. t. 127.—*Stem* branched, racemose. Tube slender, slightly dilated upward; limb somewhat contracted, its segments elliptical, concave, spreading. Filaments close together.—The leaves are linear, grassy. *Stem* slender, not quite erect, branched for the most part, each branch bearing a shortish cluster of pale rose-coloured, mostly striped, fragrant flowers, half the size of the last, their orifice mostly yellow, their segments not expanded into a salver-shape, each of them moreover being concave. Sometimes the flowers are of a pale or dull violet-colour.

7. *I. conica*. Salis. Hort. 36. Ker in Curt. Mag. t. 539. Redout. Liliac. t. 138. (*I. capitata*, var. *fl. auran- tio*; Andr. Repof. t. 50. *I. fusco-citrina*; Redout. Liliac. t. 86.)—*Stem* simple. Cluster dense. Limb spreading, twice as long as the tube. Style longer than the filaments.—The leaves are linear and grassy. *Flowers* in a *thyrsus*, or dense cluster, as large as those of *I. patens*, but less expanded, of a rich orange, sometimes a lemon-colour, with a brown and yellow eye, inodorous. The style continues undivided above the base of the anthers.—This is one of the most splendid of the genus.

8. *I. monadelphæ*. Ait. Hort. Kew. ed. 2. v. 1. 87. Ker in Curt. Mag. t. 607. (*I. columnaris*; Andr. Repof. t. 203. 211. 213. 250. *Galaxia inæstora*; Redout. Liliac. t. 41.)—Cluster corymbose. Flowers salver-shaped. Filaments united into a tube. Remarkable for its perfectly monadelphous *stamens*. The leaves are sword-shaped. *Flowers* scentless, rather large, not numerous, in a short corymbose cluster; their tube about equal in length to the limb, which is flat, usually light blue or purple, rarely yellow, always distinguished by a broad brownish, or greenish, central stain, or eye.

9. *I. columellaris*. Ait. Hort. Kew. ed. 2. v. 1. 88. Ker in Curt. Mag. t. 630. (*I. columnaris*, var. *angustifolia*; Andr. Repof. t. 342.) Cluster corymbose. Flowers nearly salver-shaped. Filaments united at their base.—Differs from the last in the *stamens* being united at their base only, the flowers scented like woodruff or new hay, not quite so horizontally expanded, opening in the morning and closing at noon, and produced in August instead of the spring. Their colour is purplish, the eye richly variegated with broad circles of black and red. The leaves are grassy.

10. *I. maculata*. Thunb. Diff. n. 19. Linn. Syst. Veg. ed. 14. 85. Mant. 320. Ker in Curt. Mag. t. 549. 789. 1285. Andr. Repof. t. 196. 256. Redout. Liliac. t. 137. Jacq. Hort. Schoenbr. v. 1. 9. t. 19—23. Schneev. Ic. t. 6. 25. (*I. capitata*; Andr. Repof. t. 23. 159. *I. spicata*, var. *viridi-nigra*; Andr. Repof. t. 29.)—Flowers nearly falver-shaped; tube capillary; limb stained at the base. Stigmas separate as low as the tube. — This common and ornamental species, figures of which are needlessly multiplied by authors, is known by the broad dark stain in the centre of the flower, while it differs from the two last in having distinct filaments. The colour of the corolla sports in every shade of crimson, pale purple, orange, yellow, even to white; though, as Mr. Ker observes, some other species may possibly be confounded under Jacquin's numerous varieties. The most remarkable variety is the green, in t. 23. of that author, Curt. Mag. t. 549, Andr. t. 29, Schneev. t. 6. The leaves are linear-sword-shaped. Spike or cluster oblong, various in length, simple and almost always solitary. Flowers about as large as those of our 5th and 7th species, their tube very slender, shorter than the limb, which is a little concave. Style enclosed in the tube; stigmas projecting.

11. *I. erecta*. Thunb. Diff. n. 18. Ker in Curt. Mag. t. 623. 1173. Jacq. Hort. Schoenbr. v. 1. 9. t. 18. (*I. polytachia*; Linn. Sp. Pl. 51. Andr. Repof. t. 155. *I. dubia*; Redout. Liliac. t. 64. Venten. Choix. t. 10.)—Corolla widely spreading; tube capillary; limb pale at the base. Stigmas separate as low as the tube.—The stem sometimes bears many spikes. The flowers are smaller than in the last, white or yellow, without any broad dark stain. They come late in the summer, and are inodorous. It is very difficult to find a good specific character between plants so variable, and yet so much alike.

Section 3. Style extended above the anthers. Bulb somewhat tuberos and deformed.

12. *I. crateroides*. Ker in Curt. Mag. t. 594. Ait. Hort. Kew. ed. 2. v. 1. 89. (*I. speciosa*; Andr. Repof. t. 186.)—Corymb of two or three flowers. Limb of the corolla hemispherical; tube very short. Style longer than the stamens. — Found at the Cape by Mr. Nevin. The flowers rarely so many as three on a stem, are large, concave, of a rich crimson within, paler externally. Their style is so long as to extend nearly to the end of the anthers before the stigmas branch off.

Section 4. Anthers short. Stigmas cloven.

13. *I. retusa*. Salisb. Hort. 35. Ait. Hort. Kew. ed. 2. v. 1. 89. (*I. polytachia*; Jacq. Ic. Rar. t. 275. Ker in Curt. Mag. t. 629. Andr. Repof. t. 128.)—Tube of the flower twice as long as the spathe; segments of the limb elliptic-oblong. Stigmas cloven and gaping.—This, being often branched, has been taken for the *polytachia* of Linnæus, a name now laid aside, as causing only confusion. That we have retained is indeed not unexceptionable, the segments of the corolla not being always abrupt. It is a tall slender species. Flowers small, rose-coloured, smelling like lily of the valley.

14. *I. scillaris*. Linn. Sp. Pl. 52. Ker in Curt. Mag. t. 542. Redout. Liliac. t. 127. (*I. pentandra*; Linn. Suppl. 92. Thunb. Diff. n. 22. *I. reflexa*; Andr. Repof. t. 14.)—Spatha as long as the tube. Segments of the limb spatulate, concave. Stigmas funnel shaped. Anthers deflexed.—That this is the real *I. scillaris* of Linnæus, not unaptly compared by him to *Scilla amoena*, appears from his herbarium; though Thunberg induced Linnæus the younger to call it *pentandra*, because the stamens are sometimes four or five, and led him to adopt his own *scillaris*, Diff. n. 14.—

It differs from *retusa* in the above characters, and has no scent. The leaves are broad, with many ribs. Flowers rose-coloured, in a long spike.

15. *I. crispa*. Linn. Suppl. 91. Thunb. Diff. n. 8. t. 2. f. 3. Ker in Curt. Mag. t. 599. — Leaves strongly undulated. Stigmas funnel-shaped, deflexed. — A beautiful little species, on account of its curiously waved and crisped leaves. The flowers are rose-coloured, inodorous; their segments obovate and concave.—Thunberg says they vary at the Cape to blue or white.

IXIA, in Gardening, contains plants of the herbaceous, bulbous, and tuberous-rooted perennial kinds; of which the species principally cultivated are, the crocus-leaved ixia (*I. bulbocodium*); the Chinese ixia (*I. chinensis*); the rose-coloured ixia (*I. rosea*); the bulb-bearing ixia (*I. bulbifera*); the bearded ixia (*I. aristata*); the bending-stalked ixia (*I. flexuosa*); the many-spiked ixia (*I. polytachia*); the spotted ixia (*I. maculata*); and the crocus-flowered ixia (*I. crocata*).

The first of these species varies with white and yellow flowers; with purplish and yellow flowers; with blue and white flowers; with white flowers; and with variegated flowers.

The third sort also varies with the three inner segments of the corolla yellow, and the three outer green; with the three inner white yellow, and the three outer greenish; with the three inner blue white, and the three outer greenish; with the three inner white, and the three outer green; with corollas wholly yellow, or wholly blue, or rose-coloured, with a yellow base; and in the size of the flowers.

The fourth sort likewise varies with the corolla purple, red and white, yellow; with the scape very short and simple, higher and branched, and bulbiferous.

The fifth species varies with the segments of the borders of the corolla of a deep and elegant purple violet colour within, three of them of the same colour on the outside, but the three others alternately of a pale dirty violet; one of these, with two on the side of it, has a double band in the throat, meeting at one end; and, according to Mr. Salisb. with whitish corollas, having a purple star, violet-coloured and yellow. Also in the figures of Miller, with the corolla of a beautiful purple on the outside, but white within, and the stem terminated by two or three flowers; with the stalk terminated by two large flowers; the outside of a violet colour, edged with white, and the inside pale blue; and with one flower, and the corolla of a most beautiful purple colour, both within and without.

The seventh kind varies with the corollas yellow and violet, of one colour.

And the ninth sort varies with a short, simple, five-flowered scape, and a dark spot above the windowed, or hyaline one; with a lofty, many-spiked, many-flowered scape; and with bright red flowers.

Method of Culture.—These plants may be increased by seeds or off-sets from the roots.

The seeds of such sorts as can be procured should be sown in pots filled with light earth in the spring, plunging them in a mild hot-bed. When the plants have attained some growth, they should be removed into separate pots of the same earth, being placed under the protection of a frame till they have taken root. They should be placed during the winter in a hot-bed frame. They may afterwards be removed into warm borders, being protected from frosts in the winter, and a few retained in pots under the frame, or in a dry stove.

But they are three or four years in flowering when raised from seeds.

The common way is, therefore, to increase them by planting off-sets from the roots, which are afforded in great plenty; the proper season for this is in the early spring, before the shooting of the root, when the roots should be removed, and the off-sets taken from them and planted out.

The old roots should not be removed oftener than every three years.

As soon as the stems and leaves decay to the roots in the borders in autumn, they should be covered over with tan a few inches thick, to protect them from frost, and the depreciations of mice.

The hardy forts serve to adorn the borders in the open ground, and the other tender forts among other potted green-house plants that require protection in winter.

IXIA, in *Surgery*, a dilated vein; a varix.

IXO, in *Geography*, a town of Japan, in the island of Nippon; 65 miles E.N.E. of Meaco.

IXORA, in *Botany*, so named from *Ixora*, a Malabar idol, to whom its flowers are offered by the Indians in their solemn festivals.—Linn. Gen. 54. Schreb. 70. Willd. Sp. Pl. v. 1. 609. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. ed. 2. v. 1. 244. Juss. 203. Lamarck Dict. v. 3. 343. Illustr. t. 66. Gært. t. 25, and t. 95.—Class and order, *Tetrandria Monogynia*. Nat. Ord. *Stellata*, Linn. *Rubiaceae*, Juss.

Gen. Ch. *Cal.* Perianth superior, four-cleft, very small, erect, permanent. *Cor.* of one petal; funnel shaped; tube cylindrical, slender, very long; limb four-cleft, flat; segments various in shape. *Stam.* Filaments four, rising above the mouth of the corolla, very short, incurved; anthers oblong. *Pist.* Germen inferior, roundish, style thread-shaped, the length of the tube; stigma cloven. *Peric.* Berry roundish, two-celled. *Seeds* solitary, convex on one side, angulated on the other.

Obf. Gærtner has remarked that the partition of the fruit is perforated just above the centre, and that the seeds are never more than two in each berry, though the Hortus Malabaricus describes three or four. Sufficient characters are wanting to distinguish this genus from *Pavetta*.

Ess. Ch. Calyx four-toothed, superior. Corolla of one petal; tube long, thread-shaped; limb four-cleft, widely spreading. Stamens rising above the mouth. Stigma cloven. Berry of two cells. Seeds solitary.

The species of this fine Indian genus have not been in general clearly understood. We shall attempt an explanation of them, with an account of some hitherto entirely non-descript.

1. *I. coccinea*. Linn. Sp. Pl. ed. 1. 110. Lamarck Dict. v. 3. 342. (Schetti; Rheede Hort. Mal. v. 2. 17. t. 13. Jafinimum flore tetrapetalo, Ixora Linnæi; Burm. Zeyl. 125. t. 57.)—Leaves elliptic-obovate, somewhat heart-shaped at the base, not longer than the corymb. Segments of the corolla ovate, acute, flat. Style but little extended beyond the tube. Native of sandy and stony places on the coast of Malabar, bearing flowers and fruit all the year. A shrub the height of a man, with round, smooth, greyish, leafy branches. Leaves opposite, nearly sessile, two inches or more in length, about one broad, more or less obovate, or somewhat elliptical, obtuse, entire, smooth, often pointed; their base for the most part heart-shaped, but varying in breadth; their upper side polished. *Stipules* embracing the stem in pairs, within the leaves, and alternate with them, awl-shaped, longer than the footstalks, broad and triangular at their base. *Corymb* terminal, repeatedly forked, dense, of

from ten to thirty inodorous flowers; the stalks smooth and shining, red, as well as the *calyx*, whose segments are ovate or triangular, their points a little spreading. Tube of the *corolla* an inch and half long, very slender; segments of the limb each about half an inch long, horizontally spreading, ovate or elliptical, pointed. The hue of the limb, according to Rheede, is a flesh-colour, deeper on the inside, at length turning yellow and paler; the tube of a coral red. *Stamens* very small and red, with yellow *anthers*, bursting longitudinally at their inner side into two cells. *Style* very little extended beyond the tube, with a thick red *stigma*, of two elliptical lobes, cohering in the dried specimen. *Berries* the size of a small currant, reddish-brown, shining, sweet and eatable.—We have never met with this species in any garden.

2. *I. flammea*. Salis. Hort. 62. (*I. chinensis*; Lamarck Dict. v. 3. 344. *I. coccinea*; Curt. Mag. t. 169. Schneev. Ic. t. 1. Ait. Hort. Kew. ed. 2. v. 1. 244. *Flamma sylvarum peregrina*; Rumph. Amb. v. 4. 107. t. 47.)—Leaves elliptic-lanceolate, bluntish, stalked; narrow at the base. Segments of the corolla orbicular, obtuse, rather convex. Style extended to half the length of the limb.—Native of Java, according to Rumphius; as well as of China, from whence we have a specimen. It is not rare in our stoves, where the splendour of its flame-coloured flowers causes it to be much admired. Lamarck has well distinguished it from the above, and Mr. Salisbury long ago made the same remark. The leaves are five or six inches long, contracted at each end, standing on short, thick footstalks. *Corymb* almost globose, composed of 100 flowers, or more, whose tube is but half, or two-thirds, the length of the former, but rather less slender; the segments of the limb broad and round, very obtuse, each not $\frac{1}{4}$ th of an inch long. *Stamens* spreading. *Style* rather longer than in the foregoing, with red spreading lobes of the stigma, but these cohere after drying.

3. *I. longifolia*. (*Flamma sylvarum*; Rumph. Amb. v. 4. 105. t. 46.)—Leaves ovato-lanceolate, taper-pointed. Segments of the corolla elliptical, sharpish, reflexed.—Native of most islands in the East Indies, according to Rumphius. We have a specimen from the late Mr. Christopher Smith, gathered in Honimoo. Those who attend to Rumphius's description and figure of his *Flamma sylvarum*, and consider that all his figures are diminished, must be aware that his plant can belong to neither of the foregoing species, for which it has been quoted indifferently. Our specimen exactly answers to his account, and is undoubtedly a new species. The leaves are seven or eight inches long, and two or three broad, ovate at the base, tapering at the end to a very fine point. *Footstalks* half an inch long, channelled. *Stipules* much shorter than in either of the former. *Corymbs* from the bosoms of the two upper leaves, as well as terminal, much branched from their very bottom, repeatedly forked, consisting of innumerable flowers, whose tube is as long and slender as in the first species, and of a light red; but the segments of the limb rather smaller, elliptical, not ovate, spreading widely, and more or less reflexed. The *stamens* are very short. *Style* but little prominent. Rumphius says the flowers are of a vermilion hue on their inside, which becomes a blood colour as they grow old, whence arises their brilliant fiery aspect, the origin of the name. The berries turn first purple and finally black.

4. *I. incarnata*. Roxb. MSS.—Leaves elliptical, sessile. Segments of the corolla roundish, obtuse, somewhat reflexed. *Corymb* above half as long as the leaves.—Native of the East Indies. Our specimen was communicated by lord viscount Valentia, who received it from Dr. Roxburgh with the above name. The leaves are two inches long, and one broad,

broad, nearly or quite sessile, elliptical, slightly pointed. *Stipulas* with a very broad short base, and short slender point. *Corymb* about two-thirds the length of the leaves, dense, level-topped, many-flowered. *Tube* of the flowers above an inch long, very slender; *limb* small, its segments shaped much like *I. flammula*, but rather less. *Style* projecting above half their length. By the name we presume the flowers are flesh-coloured. In a dried state their tube looks reddish, the limb pale.

5. *I. arborescens*. Roxb. MSS. (*I. Pavetta*; Andr. Repof. t. 78.)—Leaves elliptic-oblong, on short stalks. Segments of the corolla linear, obtuse, reflexed, one-third the length of the tube. *Corymb* dense, half as long as the leaves.—Native of the East Indies. It flowered in the dowager lady de Clifford's stove in the autumn of 1799, as Mr. Andrews mentions, but his name is altogether founded in error. The leaves are three or four inches long, and above one broad, coriaceous, widely spreading, on short thick stalks; their base slightly heart-shaped. *Flowers* innumerable, dirty-white, small, fragrant, in very dense corymbs, whose stalks are a little downy; their tube is scarcely half an inch long, segments of the limb one-third as much, linear-oblong, recurved or reflexed, as are also the *anthers*. The *style* projects in some degree; the *stigma* is large and green, cloven, but not spreading.

6. *I. barbata*. Roxb. MSS.—Leaves elliptic-oblong, pointed, stalked. Segments of the corolla obovate, obtuse, reflexed, densely bearded at their base. *Corymb* spreading, equal to the leaves.—Brought by lord viscount Valentia from the East Indies. The leaves are five or six inches long, two or more in breadth, with blunt points. *Footstalks* half an inch long. *Corymbs* three at the end of the branch, equal, many-flowered, loose and spreading, about as long as the leaves, and very broad. *Tube* of the flowers an inch and a quarter in length, slender at the base, but rather swelling upwards; *limb* reflexed, its segment $\frac{1}{4}$ th of an inch long, obovate, obtuse, twisted in the bud, revolute when dry, densely bearded at their base only, about the orifice of the tube, with longish white hairs. The colour of the flowers seems to be reddish.

7. *I. undulata*. Roxb. MSS.—Leaves ovate, pointed, stalked. Segments of the corolla oblong, reflexed, smooth, half as long as the tube. *Corymbs* numerous, dense, panicled.—For this also we are obliged to lord Valentia, who received it, with the two last, from Dr. Roxburgh. The leaves, about four or five inches long, are of a broad ovate figure, tapering to a point; their edges wavy. *Footstalks* above half an inch long. *Panicles* terminal, longer than the leaves, repeatedly forked, spreading, each branch terminating in a dense many-flowered corymb. The tube is about half an inch long, not very slender, reddish; *limb* and *stamens* half that length, reflexed. *Style* projecting to the extent of the limb.

8. *I. laxiflora*.—Leaves elliptic-oblong. Segments of the corolla spreading, convex, bearded on their upper surface. *Panicle* corymbose, lax, widely spreading, longer than the leaves. Gathered at Sierra Leone, by Dr. Adam Afzelius, to whom we are obliged for a specimen, and the publication of whose rich discoveries is much to be desired, though he himself has hitherto been unable to attain that object. We wish to secure his fame, not to encroach upon it. The leaves of this species are two or three inches long, and rather above an inch wide, all somewhat pointed; the uppermost rounded at the base, and quite sessile; the rest tapering down into a winged foot-stalk. *Stipulas* with short points. *Panicles* terminal, solitary, stalked, nearly twice as long as the leaves, many-flowered, repeatedly branched and

divaricated, slender and lax. *Calyx* tubular, with very short rounded teeth. *Tube* of the corolla an inch long, very slender, slightly swelling upwards; segments of the limb one-third as long, obovate with a small recurved point, their edges reflexed, their disc hairy half way along the middle from the base. *Stamens* very short. *Style* projecting almost the length of the limb, with long, nearly linear, stigmas. We have no account of the colour of the flowers. In the dried specimen they are dark brown, with a purplish tinge.

9. *I. parviflora*. Vahl. Symb. v. 3. 11. t. 52. Ait. Hort. Kew. ed. 2. v. 1. 244.—Leaves nearly sessile, lanceolate-oblong. *Corymbs* dense, panicled. Segments of the corolla elliptical, reflexed, one-fourth the length of the tube.—Native of the East Indies. We have a specimen sent by Koenig to Linnæus, which was never described, but we have no doubt of its being Vahl's plant. The leaves in our's are two or three inches long, or more, lanceolate inclining to obovate, coriaceous, reticulated with veins. *Footstalks* thick and very short. *Stipulas* broad and short, with a rigid straight point. *Panicle* rather longer than the leaves, erect, straight, branched from the bottom; the branches downy, each bearing a dense corymb of red flowers, whose tube is about half an inch long, not very slender, and whose limb is scarcely one-fourth that length, its segments elliptical, and smooth.

10. *I. alba*. Linn. Sp. Pl. ed. 1. 244. (Bem-schetti; Rheede Hort. Mal. v. 2. 19. t. 14.)—Leaves elliptic-lanceolate, pointed, stalked. *Panicle* corymbose, stalked, of few flowers. Segments of the corolla ovato-lanceolate, acute, about half as long as the tube.—Native of the East Indies. This species stands on the authority of the *Hortus Malabaricus*, whence Linnæus adopted it, for there is no specimen in his herbarium, and the synonym of Plukenet, t. 109. f. 2, surely belongs to our first species of all. Miller is said in Hort. Kew. to have cultivated *I. alba* before 1768, but we have never been able to satisfy ourselves concerning this species in any garden. A specimen in fruit from professor David Van Royen, of what he had from Thunberg under this name, agrees tolerably with Rheede's figure, though the fruit being globose, or rather depressed, not elliptical, is an exception, neither is our said fruit didymous, like Gartner's t. 95. Rheede contrasts his plants with the true *I. coccinea*, his Schetti, t. 13, justly saying that the leaves are rather longer, more pointed at the end, and contracted at the base. The flowers are white or yellowish, with a reddish tube. *Stamens* longish and slender. *Style* prominent. *Fruit* more oblong than round, pale green or yellowish.

11. *I. americana*. Linn. Am. Acad. v. 5. 393; excluding the synonym of Plumier. Sp. Pl. ed. 2. 160; excluding the syn. of Browne. (Petefia, N° 1; Brown. Jam. 143. t. 2. f. 3.)—Leaves elliptical, pointed at each end, on long downy footstalks. *Panicles* axillary, downy; their branches cymose.—Gathered by Dr. P. Browne near the waterfall in Mammee river in Jamaica. His own specimen is before us, shewing how much Linnæus has confused the history of this plant, by a misquotation of synonyms that belong to *Coffea occidentalis*, hence leading Lamarck to suppose these two very distinct shrubs might be one and the same. We are not however by any means of opinion that the present is a real *Ixora*, but till its fruit be better known, the question cannot be decided. Dr. Swartz appears not to have touched upon it. The leaves grow by threes, on stalks about an inch and half long, half their own length. The flowers are very small, short, thick, and downy, truly cymose, at the ends of long forked panicles.

12. *I. multiflora*. Swartz. Ind. Occ. v. 1. 240. Willd.

n 6.—“Leaves lanceolate-ovate, clustered. Flower-stalks aggregate, single-flowered, very short. Berries with one seed.”—Native of Jamaica. A still more doubtful *Ixora* than the last, or rather a *shrub* of a distinct genus. Dr. Wright, to whom we are obliged for a specimen, observes that “the *filaments* are in the bottom of the *corolla*; the *berry* white, small, sweet, with a single compressed seed.”—The small box-like *leaves*, and dense tufts of *flowers* from lateral buds, are quite foreign to this genus, as is the swelling tube of the *corolla*.

I. fasciculata, Sw. Prodr. 30, is now by that author himself removed to *Chomelia*, Fl. Ind. Occ. v. 1. 238.

How far the *Pavetta* of authors, or any of the species ranged under it, may be referable to *Ixora*, we are not at present competent to determine, but we are well assured that their generic characters require investigation. S.

IXORA, in *Gardening*, comprehends plants of the shrubby, flowering, exotic kinds, of which the species mostly cultivated are, the scarlet *ixora* (*I. coccinea*); and the white *ixora* (*I. alba*).

Method of Culture.—These plants may be increased by seeds, when they can be procured from the countries where they grow naturally, as they do not perfect them in this climate. They should be sown in small pots as soon as they arrive, and be plunged into a hot-bed when they arrive in the autumn or winter seasons, the pots being plunged in the tan-bed in the stove; but when they come in the spring, it is best to plunge them in a tan-bed under frames. The seeds sometimes come up in about six weeks, if they are quite fresh; otherwise they lie in the ground four or five months, or longer. The earth should therefore not be thrown out of the pots till there are no hopes of their growing. When the plants come up, and are fit to remove, they should be each planted in a separate small pot, filled with light earth, being preserved in the green-house or stove.

They may also be increased by cuttings, which should be planted during the summer months, in small pots, and plunged into a moderate hot-bed, covering them close either with bell or hand glasses, to exclude the external air, shading them from the sun in the heat of the day, until they have put out good roots, when they should be parted, and each put into a separate pot, treating them as the seedling plants. Mr. Curtis thinks it probable, that these plants are less tender than is supposed.

They afford variety among other stove or green-house plants.

IXWORTH, in *Geography*, a town of England, in the county of Suffolk, with a weekly market on Friday; 78 miles N.N.E. of London.

IYAR, in *Chronology*, the second month of the ecclesiastical Jewish year, answering to part of our April and May.

JYENAGUR, or *JOINAGUR*, called also *Jyepour* and *Jaepour*, in *Geography*, a circar or province of Hindoostan, situated S. of the Mewat. The capital of this circar is Jaepour or Jaynagur; 70 miles E.N.E. of Agimere. N. lat. 26° 58'. E. long. 26° 9'. The raja of Jaepour, called Jelling, has erected two observatories, one in his newly built capital of Jaepour, which is about a league from Umbeer, or Ambeer, the ancient capital, the other in one of the suburbs of Delhi. At the former observatory father Claud

Boudier, at the rajah's request, made some observations in 1732; and probably, by the assistance of the same rajah, at Agra and Delhi.

JYEPOUR, a town of Hindoostan, in the circar of Cattack; 16 miles N.E. of Cattack.

JYTEPOUR, a town of Hindoostan, in Bundelcund; 18 miles N.E. of Chatterpour.

JYVASKYLA, a town of Sweden, in the government of Wafa; 120 miles S.E. of Wafa.

IZENDICK, a town of France, in the department of the Scheldt, and chief place of a canton, in the district of L'Ecuse. The place contains 1121, and the canton 5001 inhabitants, on a territory of 112½ kilometres, in five communes.

IZER, a town of Africa, in the western part of the country of Berdoa.

IZIGINSK, a town of Russia, in the government of Irkutsk, on the river Izigin, about 15 miles from its mouth. It is defended by an enclosure of palisades, and wooden bastions, erected in piles at the four angles. These bastions are provided with cannon, and a variety of military stores. The governor's house is defended by a constant guard. The houses are constructed of wood, low, and having a regular front. The number of inhabitants is about 5 or 600, who are either merchants, or in the service of government. The commerce consists of furs, and the skins of rein deer. N. lat. 63° 10'. E. long. 159° 14'.

IZIUK, a town of Russia, in the government of Tobolsk, on the Irtysh; 240 miles E.S.E. of Tobolsk.

IZIUM, a town of Russia, in the government of Charkov, on the river Donetz; 64 miles S.E. of Charkov.

IZQUITENANGO, a town of Mexico, in the province of Chiapa.

IZTICHUILOTLI, in *Natural History*, the American name of a stone found in New Spain, and some other places; it is very hard, of a beautiful black, and takes a fine polish. The Americans are very fond of it as a gem, and wear it by way of ornament.

De Laet mentions an American stone in his possession, which was cut by the Indians into a flat oval plate, and was of a beautiful black, but with two round spots of a silvery white. He supposes this to have been the *uterinus lapis*, and probably it was either that stone, or of the species here mentioned.

IZTICPASO-QUERZALIZTLI, the name given by the natives of some parts of America, to a stone famous for its virtues in curing colic, and many other diseases, externally applied. It is of a beautiful green colour, and is by Ximenes supposed a coarse species of emerald; but is more properly a very fine kind of *lapis nephriticus*, of a pale green colour, very hard, and more pellucid than the other species of that stone, but yet always shewing that greasy look on being polished, which characterizes all the nephritic stones. It is usually found in large masses, and the Indians cut it into flat pieces, which they apply to the navel in the colic, and in other diseases to the part affected, and suppose it has great power in promoting a discharge of the noxious humours.

IZTLI, the American name of a species of stone, of which the natives made their weapons of war, &c. before they knew the use of iron. It is called by De Laet and other authors, *lapis novacularum*.

K.

K

K, A double consonant, and the tenth letter of the alphabet.

This consonant has the sound of hard *c*, and is used before *e* and *i*, where, according to the English analogy, *c* would be soft; as in the words *kept*, *king*: at the end of words it is not much used, except after *c*, and chiefly in monosyllables, as *clock*, *back*, &c. It is now properly omitted in many other words, as *music*, *public*, &c. It is also used between a vowel and the silent *e* final, as *cloke*, *broke*, &c. It likewise ends a word after a diphthong, as *look*, *break*, &c. In the present pronunciation, *k* is silent before *n*, as *knee*, *knell*. It is never doubled; but *c* is used before it, to shorten the vowel by a double consonant, as *ckle*, *pickle*.

K is borrowed from the Greek *kappa*, and was but little used among the Latins. Priscian looked on it as a superfluous letter, and says it was never to be used except in words borrowed from the Greek. Dausquius, after Sallus, observes, that it was unknown to the ancient Romans. Indeed we seldom find it in any Latin authors, excepting in the word *kalende*, where it sometimes stands in lieu of a *c*. Carthage, however, is frequently spelt on medals with a *K*: SALVIS AVG. ET CAES. FEL. KART. and sometimes the letter *K* alone stood for *Carthage*.—M. Berger has observed, that a capital *K*, on the reverse of the medals of the emperors of Constantinople, signified KONSTANTINUS; and on the Greek medals he will have it to signify KOIAH ΣΥΡΙΑ, Cœlesyria.

Quintilian tells us, that in his time some people had a mistaken notion, that wherever the letter *c* and *a* occurred at the beginning of a word, *k* ought to be used instead of the *c*. See *C*.

Lipsius observes, that *K* was a stigma, anciently marked on the foreheads of criminals with a red-hot iron.

The letter *K* has various significations in old charters and diplomas; for instance *KR*. stood for *chorus*, *K.R.C.* for *cara civitas*, *KRM.* for *carmen*. *KR. AM. N.* *carus amicus noster*. *K.S.* *chaos*. *K.T.* *capite tonsus*, &c.

The French never use the letter *k*, excepting in a few terms of art, and proper names borrowed from other countries. Ablancourt, in his dialogue of the letters, brings in *k* complaining, that he has been often in a fair way to be banished out of the French alphabet, and confined to the countries of the North.

K is also a numeral letter, signifying 250, according to the verse:

“*K quoque ducentos et quinquaginta tenebit.*”

When it had a stroke at top, *K̄*, it stood for 250,000.

K, on the French coinage, denotes money coined at Bourdeaux.

The letter *K* is the initial of no musical term; and as most of the musical technica are derived from the Italian, in

K A A

which language *K* has no admission, the Greek *kappa*, and the hard *c* being supplied by *che*, this letter will chiefly occur in German words, and proper names.

KAABA. See CAABA.

KAADÉ, in *Geography*, a town of Arabia Felix, in the province of Yemen; 12 miles N. of Taas.

KAALING, in *Ornithology*, the name of a species of starling, common in China, and not unfrequent in the Philippine islands. It is black; but its eyes, legs, and beak are yellow. It is easily kept tame, and may be taught both to sing and talk. It eats rice and insects in its wild state; but when kept in a cage, will feed very heartily on bread, and all kinds of fruit.

KAARTA, in *Geography*, a considerable state of Africa, bounded on the N. by Ludamar, on the E. by Bambarra, on the S. by Foo'adoo and Manding, and on the W. by Kaffon and Fooladoo; about 200 miles long and 80 broad. Its capital was formerly a large and populous town, called Kemmoo; which has been since destroyed. The sovereign of Kaarta received Mr. Park with great kindness; and major Houghton was the only European whom he had ever before seen. The language of the country seemed to Mr. Park to be formed of a mixture of the Mandingo and Sera-Woolli; but the Mandingo was generally understood. N. lat. 13° 10' to 15°. W. long. 5° 10' to 8° 20'.

KAT'S KILL, or CATSKILL, a small, but thriving place in America, in Green county, and state of New York, on a creek of the same name, W. of Hudson's river; 5 miles S. of Hudson city, and 125 N. of New York. In its vicinity are Kaat's Kill mountains, which are the first part of a chain of mountains, called the Alleghany, or Appalachian mountains. The township of this name contains 2468 inhabitants.

KAAU-BOERHAAVE, ABRAHAM, in *Biography*. See BOERHAAVE, ABRAHAM KAAU.

KAAWI, in *Geography*, a town of Sweden, in the government of Kuopio; 22 miles E.N.E. of Kuopio.

KAB, in the *Jewish Antiquity*. See CAB.

KABALA, in *Geography*, a town of Persia, in the province of Schirvan; 36 miles S.S.W. of Scamachie.

KABANI, in the *Oriental Offices*, a person who supplies the place of what we call the notary public. All obligations that are valid are drawn by him; and he is likewise the public weigh-master, and every thing of consequence ought to be weighed before him.

KABANSKOI, in *Geography*, a town of Russia, in the government of Irkutsk; 28 miles W.N.W. of Verchnei-Udinsk.

KABARDA, a town of Russia, in the government of Caucasus; 32 miles E. of Ekaterinograd.

KABASSI, a town of European Turkey, in the province of Albania; 24 miles N. of Alessio.

KABASSON, in *Zoology*. See *DASYPUS Unicus*.

KABBA, in *Geography*, a town of Africa, in the kingdom of Bambarra, seated on the Niger; 10 miles N.E. of Sego. It is situated, says Mr. Park, in the midst of a beautiful and highly cultivated country, bearing a considerable resemblance to the central part of England, and abounding with the "shea" tree, the fruit of which produces the shea-toulou, or tree-butter. The tree very much resembles the American oak, and the root, from the kernel of which the butter is prepared, by boiling it in water, has somewhat the appearance of a Spanish olive. The butter produced by it, besides the advantage of its keeping without salt, is, in Mr. Park's opinion, whiter, firmer, and of a richer flavour than the best butter he ever tasted made from cow's milk. The growth and preparation of this commodity seem to be among the first objects of African industry, in this and the neighbouring states, and it constitutes a main article of their inland commerce.

KABBADE, or CABADE, the name of a military habit of the modern Greeks, which they wear under another garment.

KABBALA. See CABBALA.

KABBOS, in *Ichthyology*, the name of an East Indian fish of the Mustela kind. It grows to about two feet long, has no scales, but feels smooth and soft like the eel, and is of a brown colour; the nose or snout much paler than the rest, and spotted with black. The head is obtuse, and the eyes placed very near the extremity of it.

KABERAN, in *Geography*, a town of Persia, in the province of Khorasan; 45 miles E. of Mefchid.

KABESQUI, or CABESQUI, is the name of a piece of money, equal in value to five deniers and a maille of French, coined and current only in Persia.

KABESTERA, in *Geography*, a district of Africa, on the Gold Coast.

KABIKI, a town of Japan, in the island of Nippon; 25 miles S.W. of Nigata.

KABIN, KILABIN, *Kabin*, or *Kulin*, a temporary kind of marriage, in use among the Mahometans.

The kabin is contracted before the cadi, in whose presence the man espouses the woman for a certain time, upon condition that if he quits her at the end of that term, she shall be allowed a certain sum of money.

Some authors say that the kabin is only permitted among the Persians, and in the sect of Ali; but others maintain that it is practised among the Turks.

KABIS, CHABIS, or *Gabbis*, in *Geography*, a town of Persia, in the province of Kerman. N. lat. 31° . E. long. $57^{\circ} 50'$.

KABOJA, a town of Japan, in the island of Nippon; 90 miles W. of Meaco.

KABRA, a town of Africa, in the kingdom of Tombuctoo, on the N. side of the Niger; 8 miles S.E. of Tombuctoo.

KABREND, a town of Persia, in Farsistan; 38 leagues S. of Schiras.

KABROANG, one of the Silibabo islands, in the East Indian sea, about 18 miles in circuit. N. lat. $3^{\circ} 50'$. E. long. $126^{\circ} 30'$.

KABRUA, a town of European Turkey, in Bulgaria; 16 miles S. of Ternova.

KACHAN, a town of Persia, in the province of Irac; 35 leagues N. of Ispahan.

KACHAO, a town of Africa, in the kingdom of Kambuu, on the river San Domingo, about 50 miles from its mouth; surrounded with a rampart and palisades, and defended by artillery and a Portuguese garrison. It has a

parish church, and a convent of Capuchins. N. lat. $12^{\circ} 6'$. W. long. 16° .

KACHIRA, a district of the government of Tula, in Russia, on the Occa.

KACHTAN, a district or territory of Arabia, in the province of Yemen. It is of small extent, and lies among the mountains, about three days' journey northward from Nedsjeran. It is governed by a schieck.

KACIAZYN, a town of Lithuania, in the palatinate of Wilna; 36 miles N.E. of Wilna.

KACOVA, a town of Transylvania; 12 miles S. of Colofvar.

KACUNDY, a town of Africa, in the country of the Foulahs, seated on the E. side of the river Nunez; not far from its opening into the Atlantic.

KADAN, or CAADAN, a town of Bohemia, in the circle of Saatz; 12 miles W. of Saatz. N. lat. $50^{\circ} 20'$. E. long. $13^{\circ} 16'$.

KADAR, a town of Mingrelia; 16 miles N.N.E. of Anergilia.

KADANAKU, in *Gardening*, the name of a plant. See *ALOE*.

KADARI, or KADARITES. See *CADARI*.

KADELY, a town of Bengal; 8 miles N.W. of Ramgur.

KADEN, in *Geography*, a town of Russian Lithuania, in Polesia; 14 miles S. of Brzesc.

KADEN-KAN, a town of Asiatic Turkey, in Carmania; 28 miles W. of Cogni.

KADER, an island at the N.W. extremity of the Persian gulf, formed between the streams of the Euphrates and the Tigris.

KADESIA, a town in the Arabian Irak; 80 miles S.W. of Bagdad.

KADJANG, a town on the W. coast of the island of Celebes. S. lat. $6^{\circ} 28'$. E. long. $119^{\circ} 50'$.

KADIEL, or KADYI, a town and district of Russia, in the government of Kostroma; 68 miles E.N.E. of Kostroma.

KADITTE, a town of Prussia, in the circle of Natangen; 23 miles S. of Brandenburg.

KADNIKOV, a town and district of Russia, in the government of Vologda; 10 miles N.N.E. of Vologda.

KADOM, a town and district of Russia, in the government of Tambov, or Tambou, on the river Mokcha; 108 miles N.N.E. of Tambov.

KADRAGUTA, a town of Hindoostan, in the circle of Singboon; 40 miles S.E. of Doesa.

KADROS, a town of Asiatic Turkey, in Natolia; 28 miles E. of Amasieh.

KADSINDA, a town of Japan, in the island of Nippon; 30 miles S.W. of Nambu.

KADZURIM, a town of Hindoostan, in Bahar; 12 miles N.E. of Rotasfur.

KÆADAS, *καϊδαρ*, among the Lacedæmonians, a dungeon for throwing their criminals into. It was of the same nature with the Athenian barathron, or *orygma*.

KÆKURIAGHAKA, in *Botany*, a name used by some authors for the tree which affords the gum elemi of the shops.

KÆMPFER, ENGELBERT, in *Biography*, a celebrated German physician and naturalist, was born, in the year 1651, at Lippe, in Westphalia. It appears that he was educated in Sweden, where, for some years, he cultivated with zeal and success the several studies of physic, natural philosophy, and natural history. His great desire for travelling made him seize with avidity an opportunity of accompanying the Swedish ambassador Fabricius to Persia; whom he attended in the

the capacity of secretary. He departed from Stockholm in 1683; spent a short time at Moscow, and then proceeded to Ispahan, where he remained two years. His ardour in the pursuit of knowledge had so much increased during this period; that instead of returning with Fabrius, he obtained the appointment of chief surgeon to the Dutch East India company, in which capacity he had the full enjoyment of his wishes, for he penetrated as far as the kingdoms of Siam and Japan. The geography of these parts had been but very imperfectly known, till Kämpfer's genius and industry supplied the deficiency, and the world is indebted to him, for having first given a correct idea of the situation of different places, which had before been inaccessible to strangers. On his return to Europe in 1694, he graduated at Leyden, and settled in his own country. Here he did not remain idle, but was constantly employed in the composition of several works, and in the practice of physic. He was appointed physician to his sovereign, and terminated a useful life in the year 1716, aged 65. His inaugural dissertation, published at Leyden in 1694, is intitled "Decas observationum exoticarum." Of this a copy is preserved in Dr. Smith's library, but we have never met with any other. The subjects on which it treats are, 1, the *Agnus Scythicus*, or Borometz; 2, the bitterness of the Caspian sea; 3, of the native *Mumia*, or bitumen, of Persia; 4, of the Torpedo, or electrical fish of the Persian gulf; 5, of the drug called dragon's blood, produced by the fruit of a palm; 6, of the *Dracunculus* of the Persians, a sort of worm proceeding from a tumour in the skin; 7, on the *Andrum*, or endemic hydrocele of the Malabars; 8, on the *Perical*, or ulcer of the feet among the same people; 9, on the cure of the colic amongst the Japanese by puncture with a needle; 10, on the *Mova*, or actual cautery, of the same people and the Chinese. These subjects are, as Haller observes, all of them probably treated more fully in the great work of our author, published at Lemgow in 1712, entitled "Amoenitates Exoticae," and so often quoted by Linnæus for its botany, as well as other authors for its authentic details, relating to the history and manners of Persia, and other parts of the East. His history of Japan is well known by the English translation in folio, and is extremely valued for its accuracy and fidelity. Kämpfer was skilled in the use of the pencil, as the plates of his works testify. Some botanical drawings of his, made in Japan, are preserved in the British Museum. Of these Sir Joseph Banks, in 1791, liberally presented the learned world with 59 folio engravings at his own expence. Many of the plants are still undetermined by systematic botanists. Hall. Bibl. Bot. Kämpfer. Opera.

KÆMPFERIA, in Botany, named by Linnæus in commemoration of KÆMPFER, (see that article,) was selected for that purpose with the more propriety, because of the excellent original account and figure given of the plant by this writer, in his valuable *Amoenitates Exoticae*, 901.—Linn. Gen. 4. Schreb. 5. Willd. Sp. Pl. v. 1. 15. Mart. Mill. Dict. v. 3. Roscoe Tr. of Linn. Soc. v. 8. 350. t. 20. f. 10. Dryandr. in Ait. Hort. Kew. ed. 2. v. 1. 7. Juss. 64. Lamarek Illust. t. 1.—Class and order, *Monandria Monogynia*. Nat. Ord. *Scitamineæ*, Linn. Roscoe. *Cannæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, of one leaf, tubular, sheathing, membranous, splitting on one side. *Cor.* of one petal; tube about as long as the calyx, cylindrical, erect; outer limb in three equal, spreading, linear, acute, involute segments; inner two-lipped, the upper lip of two oblong lobes, lower of one or two broader, rounded, spreading ones. *Stam.* Filament one, erect, oblong, flat, much shorter than the limb, extending much above the anther,

and terminating in two spreading equal lobes; anther attached by its back to the middle of the filament, of two oblong, nearly marginal, rather distant lobes, meeting round the style, bursting at their outer edge. *Pist.* Germen inferior, small, roundish; style thread-shaped, embraced by the anther; stigma cup-shaped, concave, fringed, projecting a little beyond the anther. *Peric.* Capsule roundish, somewhat triangular, of three cells and three valves. *Seeds* several.

Eff. Ch. Anther two-lobed. Filament extending above the anther, two-lobed at the top. Outer limb of the corolla in three equal, linear, acute lobes; inner two-lipped.

1. *K. Galanga*. Galangale. Linn. Sp. Pl. 3. Hort. Cliff. 2. t. 3. Redout. Liliac. t. 144. Sims in Curt. Mag. t. 850. (Wanhom; Kämpfer. Amoen. Exot. 901. t. 902.)—Upper segments of the inner limb of the corolla obtuse, slightly three-lobed; lower ones deeply separated, undulated. Leaves depressed, broad-ovate, pale beneath.—Native of the East Indies. Kämpfer met with it in Japan in a cultivated state only. Witli us it is rare; kept in the stove, and flowering in July. The root is perennial, tuberous, throwing out elliptical stalked knobs, like the Peony. These are fleshy and white within, with a grateful and pungent aromatic flavour, which remains long after they are dried. They are still used in the East for their stomachic and tonic properties, but are laid aside in European practice. *Stem* none. *Leaves* several, sheathing, spreading in a depressed position, three or four inches long, and nearly as broad, many-ribbed; dark-green, and smooth above; paler, glaucous and downy beneath. *Flowers* several, radical, sessile, in the centre of the leaves, white, with two purple spots at the base of the lower or front lobes of the inner limb. We cannot help remarking the superiority of Linnæus's fine engraved plate over any coloured one that has met our notice.

2. *K. rotunda*. Round-rooted Kämpferia. Linn. Sp. Pl. 3. Sims in Curt. Mag. t. 920. Woodv. Med. Bot. t. 133. (*K. longa*; Jacq. Hort. Schoenbr. v. 3. 37. t. 317. Redout. Liliac. t. 49. Malan-kua; Rheede Hort. Mal. v. 11. 17. t. 9.)—Upper segments of the inner limb of the corolla acute, entire; lower ones deeply separated, obovate. Leaves erect, elliptic-oblong, acute, coloured beneath.—Native of the East Indies. Mr. Miller is said to have cultivated it in 1768, but the plants, now not unfrequent in the stoves of this country, all probably originated from what Sir George Yonge introduced in 1791. The knobs of the roots, rather less oblong than those of the former, are pungent and aromatic. The leaves grow upright, and are a foot long, remarkable for the fine purple colour of their under side. The flowers appear early in the spring, before the leaves, with a few sheathing green bractæas that grow likewise from the root. They are sweet-scented, white, except the lower lip, which is of a light purple, prettily variegated.

3. *K. angustifolia*. Narrow-leaved Kämpferia. Roscoe Tr. of Linn. Soc. v. 8. 351.—Upper segments of the inner limb of the corolla linear, obtuse; lower one emarginate. Leaves lanceolate, pale beneath.—Native of the East Indies, from whence it was introduced into the Kew garden in 1797 by Sir Joseph Banks. It flowers in the stove, about March or April. Mr. Roscoe examined it in the botanic garden at Liverpool, and all our knowledge of this species is comprized in the above definition.

4. *K. ovata*. Ovate Kämpferia. Roscoe, ibid. (Manjakua; Rheede Hort. Mal. v. 11. 19. t. 10.)—Lower segment of the inner limb of the corolla lanceolate, undivided. Leaves ovate.—All our knowledge of this plant is derived from the Hortus Malabaricus, from whence Mr. Roscoe adopted

adopted it, there being no doubt of the genus. It is there said to be perennial, flowering in April and May. The *root* is a globose tuber, an inch in diameter, yellow internally, with concentric red and orange lines; of a very strong taste and smell, resembling ginger and saffron. *Leaves* a foot long, elliptical, pointed, tapering down into sheathing footstalks, of a pleasant scent and bitterish taste. *Flowers* six or seven from the centre among the leaves, short-lived, white with a tinge of red, their tube much longer than the limb. Rheede's figure displays the generic character sufficiently well, and shews the lip, or lower segment of the inner limb to be undivided, ovate, acute, and wavy. *Seeds* rarely perfected. The *Curcuma rotunda* of Linnæus seems chiefly to depend on this synonym of Rheede. His herbarium throws no light upon the matter.

KEMPERIA Rotunda, in the *Materia Medica*. See ZEDOARY.

KAEN, in *Geography*, a town of Africa, and capital of a kingdom, on the banks of the river Gambia. N. lat. 13°.

KAFAR TUTHA, a town of Asiatic Turkey, in the province of Diarbekir; 32 miles S.W. of Nisibin.

KAFER, a town of Persia, in the province of Faristan; 40 miles S. of Schiras.

KAFFABA, a town of Africa, and capital of a kingdom of the same name, in Soudan. N. lat. 11° 45'. W. long. 0° 12'.

KAFFERS, or rather Koussis, a tribe of people who inhabit those parts of Africa that lie to the north and east of the colony of the Cape of Good Hope. Mr. Barrow has not been able to ascertain how far the belt of country extends in width across the southern part of Africa, that is inhabited by the Kaffers; but the points on each coast to which they do not extend are sufficiently determined. To the southward of the Portuguese settlement of Rio de la Goa, the natives are Kaffers, but appear to be a degenerated race. They are, however, *free*; nor has Portuguese avarice yet dared to attempt to make them slaves. This is not the case to the northward. At Mozambique and Soffala, the black people are all negroes; not indeed the natives of the sea-coast, but such as are brought down from the interior as articles of trade. From Mozambique, they have now a direct communication across the continent with their settlements of Congo, Loango, and Benguela, on the west coast, as appears from the information of a Portuguese slave merchant, between which negro merchants are established in different parts of the country. In the line of this route there are therefore no Kaffers. It further appears that another powerful tribe of the same nation, called "Baroloos," inhabit the country under the southern tropic, nor are these the last to the northward. According to the account given of this people, they are of a kind and friendly disposition; their town is so extensive, that if a person set out in a morning from one extremity and travelled to the other, he would not be able to return before the following day; and contains many thousand inhabitants; the people are very ingenious in carving of wood, and have furnaces for smelting both copper and iron; they are very rich in cattle, and their gardens and lands are better cultivated, and their dwellings much superior to those of *Leetakoo*, which see. The "Damaras" also, who possess the art of smelting copper from the ore, are inhabitants of the tropic; and they are complete Kaffers, differing in no respect from those on the eastern coast. Mr. Barrow, therefore, supposes, that a line drawn from the 24th parallel of latitude on the E. coast to the 20th on the W., may nearly mark the boundary between the Kaffers and the Negroes.

An open and manly deportment, says Mr. Barrow, free

from suspicion, fear, or embarrassment, seems to characterize the Kaffer chiefs. Though extremely good-humoured, benevolent, and hospitable, they are neither so pliant nor so passive as the Hottentot. Those of the poorer class sometimes seek for service among the boors, and engage themselves for so many moons in consideration of so many head of cattle; but they never suffer themselves to be duped out of their hire like the easy Hottentots. They are for the most part tall, upright, and well-made men; and in their stature and strength they exhibit satisfactory evidence that animal food is by no means necessary to promote the growth of the human species, or to add strength of fibre to the muscular parts of the body. Milk in a curdled state is the principal food of the Kaffers. To this they sometimes add a few gramineous roots, berries of various kinds, the seeds of the "*Strelitzia Regina*," and the pith of a large palm, to which botanists have given the name of *Zamia*. They rarely kill any of their cattle, unless upon particular occasions. They possess no other domestic animals to yield them food. In the whole Kaffer country they have neither sheep nor goats, pigs nor poultry. They cultivate no kind of grain nor vegetables on this side of the Great Fish river, and very little on the other side; but the Kaffer tribes more to the westward, are very considerable horticulturists. The commissioners, sent out by the British government in the year 1801, to endeavour to procure a supply of draught oxen, found extensive fields of a species of *Holcus* near the city *Leetakoo*, the capital of a tribe of Kaffers, called "*Booshooana*," situated at the distance of 16 days' journey beyond the Orange river, in the direction of north-east from the Cape. The women here, as well as among the eastern Kaffers, and indeed in all nations just emerged from a savage state, went through all the hard labour and drudgery that were required for the support of the family. They not only performed the task of breaking up the ground with a kind of hoe made of iron, and afterwards planted it; but they constructed their habitations, and collected the materials that were necessary. They reaped the grain, cleared it from the husk, and laid it up in the granaries, which, with other earthen pots and wooden vessels, were the work of their hands. The men prepare the skins and hides which serve for shoes, and make them up into cloaks for themselves, their wives and children. They attend also the cattle, milk the cows, and hunt the antelopes and other game, with a weapon called the *Hassagai*, which is used also in battle.

Mr. Barrow is of opinion, that the Kaffers were not the aborigines of the southern angle of Africa; but that they might, perhaps, derive their origin from some of those wandering tribes of Arabs known by the name of *Bedouins*. Their pastoral habits and manners, their kind and friendly reception of strangers, their tent-shaped houses, the remains of Islamism discoverable in one of its strongest features, the circumcision of male children, universally practised among the Kaffer hordes, seem to indicate their Arabic origin and their affinity to the Bedouin tribes. Their countenance also is Arabic; the colour only differs, which in some tribes varies from deep bronze to jet black, but the latter is most generally the prevailing colour. Nor is it likely that they owe this colour to their connection with those blacks that are usually called negroes, as they have no resemblance, in any part of the body, to the peculiar conformation of this race of human beings. To the Ethiopians or Abyssinians they have a much closer resemblance. Barrow's *Travels in Southern Africa*. See CAFFRARIA and DELAGOA Bay, under which latter article the reader is requested to substitute Kaffers for Kuffers, a typographical error.

KAFF ERRIZÉ, a town of Egypt, on the left bank of the Nile; 18 miles S. of Cairo.

KAFF *el Rifk*, a town of Egypt, on the left bank of the Nile; 3 miles N.E. of Atfieh.

KAGA, a town of Japan, on the N.W. coast of Nippon. N. lat. $57^{\circ} 15'$. E. long. $137^{\circ} 40'$.

KAGAN, a town of Russia, between Astrachan and the Caspian sea; 10 miles S. of Astrachan.

KAGEROD, a town of Sweden, in the province of Skone; 12 miles S.E. of Helsingborg.

KAGNAS, a small island in the gulf of Bothnia. N. lat. $64^{\circ} 48'$. E. long. $21^{\circ} 7'$.

KAGZEVAN, a town of Asiatic Turkey, in the government of Erzerum. N. lat. $39^{\circ} 35'$. E. long. $43^{\circ} 20'$.

KAHAKAMAN, a small island in the East Indian sea, near the N. coast of Borneo. N. lat. $7^{\circ} 21'$. E. long. $117^{\circ} 33'$.

KAHEC, a town of Persia, in Segestan; 37 miles S.W. of Dergasp.

KAHEDE, a town of Africa, on the N. side of the Senegal. N. lat. $16^{\circ} 8'$. W. long. $11^{\circ} 47'$.

KAHEM, or CAJEM, a town of Asiatic Turkey, on the Euphrates; 50 miles W.S.W. of Ana.

KAHON, a town of Bengal; 20 miles S. of Moorshedabad.

KAHIASSCE, in the Turkish court, an officer of state, answering to our master of the ceremonies.

KAHIRIA, in *Botany*, Forfk. *Ægypt*. Arab. 153. See *ETHULIA conyzoides*.

KAHL, in *Geography*, a town of Germany, on a river of the same name, near the Maine; 4 miles S. of Hanau.

KAHLA, a town of Saxony, in the principality of Altenburg, on the Saal; 36 miles W. of Altenburg. N. lat. $50^{\circ} 48'$. E. long. $11^{\circ} 27'$.

KAHOKIA, a post-town of America, and chief town of St. Clair county, in the Indiana territory, containing 719 inhabitants.

KAHONE, a town of Africa, in the kingdom of Bursali. N. lat. $13^{\circ} 56'$. W. long. $16^{\circ} 8'$.

KAHUN, a town of Persia, in the province of Kerman; 36 miles S.W. of Sirgian.

KAHUNSILYA, or KAONSALIA, in *Hindoo History*, was the wife of Dasaratha, to whom she bore Rama, distinguished by the epithet of Chandra, (meaning Lunarman,) from other heroes of the same name. See RAMA.

KAI, in *Geography*, a town of Russia, in the government of Viatka, on the Kama; 124 miles N.E. of Viatka.

KAJAAGA, or GALLAM, as the French call it, a small negro kingdom of Africa, which occupies the extremity of the navigable course of the Senegal, terminated in this place by the cataract of F'low. This country is bounded on the N. by the Senegal, on the S.E. by Bambouk, and on the W. by Bondou and Fouta Torra. The residence of the king is at Maana, within a short distance of the ruins of Fort St. Joseph, where the French had formerly a small factory. The air and climate are, according to Mr. Park, more pure and salubrious than at any of the settlements towards the coast; the face of the country is agreeably interspersed with hills and vallies, and the windings of the Senegal, which descends from the rocky hills of the interior, render the scenery on its banks picturesque and beautiful. The natives are called Sera-Woollies, and seem to be pure negroes, without any Moorish admixture, and are naturally of a mild and docile disposition. With regard to their colour, which is a jet-black, they are not to be

distinguished from the Jaloffs. They are much addicted to trade, and formerly carried on a considerable commerce with the French in gold and slaves: they are reckoned tolerably fair and just in their dealings, though Mr. Park lost among them about one-half of his goods and apparel: they are much devoted to the acquisition of wealth, and they derive considerable profit from the sale of salt and cotton cloth in distant countries. Their language abounds much in gutturals, and is less harmonious than that of the Foulahs; it is, however, well worth acquiring by those who have occasion to travel through this part of the African continent; as it is very generally understood in the kingdoms of Kasson, Kaarta, Ludamar, and the northern parts of Bambarra. In all these countries the Sera-Woollies are the chief traders.

KAIDA, in *Botany*, Rheede Hort. Mal. v. 2. t. 1—8. See PANDANUS.

KAIDERM, in *Geography*, a town of Persia, in Segestan; 90 miles W. of Zareng.—Also, a town of Persia, in the province of Khorasan; 15 miles E. of Tershiz.

KAI-FONG, or CAI-FONG, a city of the first rank in China, the capital of Ho-nan, situated at the distance of two leagues from the river Hoang-ho. As the river is higher than the city, it is subject to inundations, for the prevention of which, strong dykes have been raised which extend more than 30 leagues. On occasion of a siege in 1642, by an army consisting of 100,000 rebels, the commander of the troops sent to relieve it determined to drown the enemy by breaking down the large dyke of Hoang-ho; the stratagem succeeded, the city was overflowed, and 300,000 inhabitants perished. It has been rebuilt since this calamitous event, but in a style far inferior to that of its former magnificence. Its jurisdiction comprehends four cities of the second class and 30 of the third.

KAIGOL, a town of Persia, in the province of Khorasan; 225 miles N. of Herat.

KAIGUEZ, a town of Asiatic Turkey, on the S. coast of Natolia; 18 miles S. of Mogla. N. lat. $36^{\circ} 50'$. E. long. $28^{\circ} 19'$.

KAIGUM, a town of Hindoostan, in the circar of Aurungabad; 30 miles S.W. of Aurungabad.

KAIHA, a town of Sweden, in the province of Tavastland; 60 miles N.N.E. of Jamsio.

KAJIPET, a town of Hindoostan, in the circar of Cuddapa, on the Pennar; 20 miles S.E. of Cuddapa.

KAILAFUETUEVSKOI, a town of Russia, in the government of Irkutsk, on the Argun; 160 miles S.S.E. of Nerchinsk.

KAILASA. Hindoo mythologists have assigned different places of resort or habitation to their different deities: that of Siva is Kailasa, sometimes written Cailas, which is described as one of the three peaks of the wonderful mountain, Meru. (See MERU.) Here the gods, with their comforts, animated with music, dancing, and ambrosia, called by the Hindoos amrita (see KURMAVATARA), pass their hours in banquets and happy dalliance, reminding us strongly of the tales of our own classics; and appearing indeed to be the same stories under different names. This similarity occurs in every page of Moor's Hindoo Pantheon, although the author in that work professes to avoid the discussion of such similarities. (See KALIYA.) The following instance, from page 47, will farther illustrate this and the present article. "The comparison between Siva and Jove runs parallel in many instances. In the capacity of avenger and destroyer Jove overthrew the Titans and giants whom Typhon, Briareus, &c. led against the god of Olympus, to whom an eagle brought lightning and thunderbolts during the warfare. In

In a similar contest between Siva and the Daityas, or children of Diti, who frequently rebelled against heaven, Brahma is said to have presented the god of destruction with fiery shafts. As the Olympian Jupiter fixed his court and held his councils on a lofty and brilliant mountain, so the appropriated feat of Mahadeva, whom the Saivas consider as the chief of the deities, is mount Kailasa, every splinter of whose rocks is an inestimable gem." Kailasa is therefore the Olympus of Siva or Mahadeva. See SIVA.

KAIMACHAN, among the Turks. See CAIMACHAN.

KAIMENI, in *Geography*, a small island in the Grecian Archipelago. N. lat. $36^{\circ} 57'$. E. long. $23^{\circ} 26'$.

KAIMOO, a town of Africa, in Bambarra, seated on the Niger. N. lat. $13^{\circ} 56'$. W. long. $3^{\circ} 46'$.

KALMOW, a town of Hindoostan, in Bundelcund; 12 miles N. of Chatterpour.

KAIN, a town of Persia, in Cohestan; 60 miles S.S.W. of Herat.

KAINER, a town of Persian Armenia; 24 miles S.E. of Erivan.

KAINGERSKOI, a small island in the North Pacific ocean, near the east coast of Kamtschatka, belonging to Russia. N. lat. $53^{\circ} 40'$. E. long. 160° .

KAINSK, a town of Russia, in the government of Tobolsk, on the Om. N. lat. $56^{\circ} 55'$. E. long. $77^{\circ} 54'$.

KAIRA, a town of Hindoostan, in Guzerat; 10 miles S.S.W. of Mahmoodabad.

KAIRABAD, a town of Hindoostan, and capital of a circar in Oude, to which it gives name. The circar is bounded on the N. by Thibet, on the E. by Bahraitch, on the S. by Lucknow, and on the W. by Rohilcund; and is about 80 miles long and from 50 to 76 broad. The town is 86 miles N.W. from Fyzabad. N. lat. $27^{\circ} 30'$. E. long. $81^{\circ} 8'$.

KAISARIEH, anciently *Mazaca* and *Cæsarea of Cappadocia*, a town of Asiatic Turkey, in the province of Caramania, the capital of a Sangiakat, situated at the foot of a mountain, always covered with snow, about five or six miles in circumference; surrounded with walls and defended by a castle. This town is well peopled, and in each of the 180 districts to which it is divided, it has a mosque or chapel. The Greeks have two churches, one of which is a Metropolitan, and the Armenians have three. The article which constitutes its principal trade is Morocco leather; 250 miles E.S.E. of Constantinople. N. lat. $38^{\circ} 20'$. E. long. $35^{\circ} 18'$.

KAISENI, a town of Walachia, on the Ardgis; 25 miles N.W. of Bucharest.

KAISERBERG, a town of France, in the department of the Upper Rhine, and chief place of a canton, in the district of Colmar. The place contains 2428, and the canton 13,606 inhabitants, on a territory of 125 kilometres, in 13 communes; 5 miles N.W. of Colmar.

KAISERSBERG, a town of the duchy of Stiria, having a castle on a hill; 5 miles S.W. of Leoben.

KAISERSECH, a town of France, in the department of the Rhine and Moselle, and chief place of a canton, in the district of Coblenz; 12 miles W. of Coblenz. N. lat. $50^{\circ} 18'$. E. long. $7^{\circ} 2'$. The place contains 435, and the canton 2413 inhabitants, in 16 communes.

KAISERSLAUTERN, a town of France, and principal place of a district, in the department of Mont Tonnerre; 24 miles N.W. of Landau. N. lat. $49^{\circ} 27'$. E. long. $7^{\circ} 47'$. This town was ceded to France by the elector of Bavaria in 1802. The place contains 2363, and the canton 8640 inhabitants, in 21 communes.

KAL-TON-GI, a town of the island of Borneo; 65 miles S.S.E. of Negara.

KAJUC, a town of Asia, in the country of Kharafin; 23 miles N.W. of Samarcand.

KAKA-PAKSHA-DHARA, a name of Rama, in Hindoo history, and of other warriors, who had a habit of shaving their heads, leaving only the hair projecting over their ears, which was fancied to resemble the wings of a crow. The name means *bearing-crow-wings*.

KAKA-TODDALI, in *Botany*, Rheed. Hort. Mal. v. 5. St. t. 41, is *Paullinia glottica* of Linnæus, distinguished as a new genus by Jussieu, under the uncouth name of *Toddalia*, and by Schreber under that of *Crantzia*. There having been another genus already given to professor Crantz, Dr. Smith has called that of which we are speaking *Scopolia*, Plant. Ic. under t. 34. See SCOPOLIA.

KAKATOES, in *Ornithology*. See PSITTACUS.

KAKBERG, in *Geography*, a town of Prussia, in the Frisch Nerung; 18 miles E.N.E. of Vogelsang.

KAKEGAVA, a town of Japan, in the island of Niphon; 95 miles S.W. of Jedo.

KAKELIK, in *Ornithology*, a species of *Tetrao*; which see.

KAKHET, or KAKHETI, in *Geography*, the eastern part of the principality of Georgia, comprehending a part of the ancient Iberia, about 180 miles long and 90 broad. This state, as well as Karduelia, borders northwards on the Kabarda, eastwards on Daghestan, southwards on the Persian Armenia, and westwards on Immeritia. This state and Karduelia are under the sole sovereignty of a prince of the Kakhetian dynasty. The residence is Teflis. The air is salubrious, but the country is thinly inhabited. The town Kaketi, in this province, is situated near mount Caucasus; 45 miles N.N.E. of Teflis. See GEORGIA.

KAKI, a town of Japan, in the island of Niphon; 70 miles N. of Meaco.

KAKILAN, a town of Persia, in the province of Segestan; 65 miles N. of Bost.

KAKILE, in *Botany*, Broter. Lusit. v. 1. 498. See CAKILE, and BUNIAS, p. 12.

KAKKABBAN, in *Geography*, an island in the East Indian sea, being one of the group called "Mer.tiba;" 40 miles from the E. coast of Borneo. N. lat. $2^{\circ} 8'$. E. long. $116^{\circ} 50'$.

KAKKAWATA, one of the Friendly islands.

KAKOPIT, in *Ornithology*. See CETHIA *Amboinensis*.

KAKOULI, in *Geography*, a town of Turkish Armenia; 23 miles E. of Baibourdi.

KAKURI, a town of Japan, in the island of Niphon; 85 miles N.E. of Meaco.

KAL, or KALA, in *Hindoo Mythology*, a name of Siva in his character of the *Destroyer*, in which he agrees with Saturn or Time, and is called also Maha-kala, *maha* being an epithet equivalent to *great*. Kali, or Maha-kali, is a name of his consort Parvati, in one of her avenging or terrific characters, as she appears in several of the plates of Moor's Hindoo Pantheon, wherein one of Kal is described as "Eternity, at the period of Maha-pra-laya, or grand consummation of all things. In the original he, like his name, is *black*; he holds the roll of fate, and a scymitar to execute its destructive decrees. He devours man, his own offspring, towns, cities, "the great globe itself and all that it inherits"—the universe. The great personified powers of the Almighty, Brahma, Vishna, and Siva, "alike await the inevitable doom;" they also "fall into the jaws of non-existence." Kala will then, like Saturn, destroy himself, and nothing will remain but Brahm; the eternal one," p. 30. See KALI, KALPA, and MAHA-KALA.

KALAAAT.

KALAAT-EL-NEGUER, in *Geography*, a town of Asiatic Turkey, in the province of Diarbekir; 25 miles S. of Bir.

KALADGIK, a town of Asiatic Turkey, in Natolia; 8 miles S.E. of Kiangari.

KAL-AGNI-RUDRA, in *Hindoo Mythology*, a name of Siva, or rather three of his names combined. Kal is his name as Time, Agni as Fire, Rudra as Fate. See **KAL**, **SIVA**, and **RUDRA**.

KALANSHEE, in *Geography*, a town of Africa, in the country of Gonjah.

KALANTEKA, in *Hindoo Mythology*, is a name given to Yama, the judge of departed souls. (See **YAMA**.) It means the destroyer of Kal, or of Time, and is a personification of great boldness. See **KAL**.

KALATOE, in *Geography*, an island in the East Indian sea, about 30 miles in circuit. S. lat. $7^{\circ} 18'$. E. long. $122^{\circ} 15'$.

KALATU SEFID, a town of Persia, in Faristan; 10 miles N. of Neubendjan.

KALBA, a town of Persia, in the province of Mazanderan; 60 miles E. of Fehrabad.

KALBRA, or **KELBRA**, a town of Germany, in the principality of Schwarzburg-Rudolstadt, on the Helm; 27 miles N. of Erfurt. N. lat. $51^{\circ} 28'$. E. long. $11^{\circ} 4'$.

KALCKREUTH, a town of Germany, in the territory of Nuremberg; 7 miles N. of Nuremberg.

KALCOBO, a small island in the East Indian sea. S. lat. $5^{\circ} 20'$. E. long. $117^{\circ} 39'$.

KALDEKIRCHEN, a town of France, in the department of the Roer; 8 miles N.N.E. of Ruremond.

KALDI, GEORGE, in *Biography*, a native of Hungary, was born in Timnaw about the year 1572, and from his connections he might probably have attained to considerable preferment in the church, but he preferred enrolling himself in the society of the Jesuits. He was received into the order at Rome, and returning to his own country, he was banished into Transylvania, with the other members of the society, during the commotions which, at that time, agitated the kingdom. After this he discharged the duty of theological professor in the university of Olmutz, and filled some other important posts in different places. His last retreat was to a college which he built at Presburg, where he died, in the year 1634, at the age of sixty-two. He was regarded as one of the most eloquent preachers in Hungary. He published a volume of sermons at Presburg in 1631, but he is chiefly celebrated, as an author, for having undertaken and completed a translation of the bible from the Vulgate into the Hungarian tongue, which was printed at Vienna, in 1626.

KALDUROSAN, in *Geography*, a town of Walachia; 10 miles N.N.E. of Bucharest.

KALE, WILLIAM, in *Biography*, a painter of still life. In the catalogue of the gallery of the Louvre, at Paris, he is called *Kalf*, and there are two exquisite works of his, uniting the merits of Rembrandt and Teniers. He was born at Amsterdam in 1630, and was a disciple of Hendrick Pot, a portrait and historical painter; of whom he learned the practice of the art, but from whom he varied in the application of it; and applied his talents, which were very considerable, in a close imitation of objects in still life; which he composed with great beauty and effect. He possessed an eye informed with the power of Rembrandt's arrangements and contrast of light and shade, and a hand, that managed the pencil with the neatness and correctness of Teniers: his pictures are therefore as agreeable perhaps as

it is possible for the art to exhibit; when the kind of subjects which he chose are represented. He died in 1693.

KALE, in *Botany*, &c. See **BORECOLE**, **BRASSICA**, and **CRAMBE**.

KALE, in *Agriculture*, the common name of a plant of the brassica kind, which is occasionally cultivated in the field for the use of live stock. There are several varieties of it in cultivation, which are all very hardy in their nature, rise to a considerable height in the stem, and afford a large proportion of green food per acre. They are an excellent sheep feed in the early spring months, as March and April, throwing out fresh sprouts as the old ones become removed. The bite of sheep is not by any means injurious to them; and they are capable of being fed off without hurdling, which is a very considerable advantage in most situations. See **BORECOLE** and **BRASSICA**.

KALE, in *Gardening*, the common name of a hardy tall growing plant of the cabbage kind; of which there are several varieties cultivated in gardens for winter and spring use, but the curled sorts are probably the best for the table. They are capable of being had recourse to for a considerable length of time, as they throw out sprouts in great abundance, and are ready in those severe parts of the winter season when but few other greens can be procured, especially in the more northern parts of the island. See **BRASSICA** and **BORECOLE**.

KALENBERG, in *Geography*, a general name given to a ridge of Aultrian mountains, extending from near the source of the river Save, towards the Danube, about 9 British miles on the west of Vienna, where it is called Leopoldsberg; and supposed by Busching to be the ancient Cetius. This ridge of Kalenberg was the western boundary of Germany till about the year 1040, when it was removed E. to the river Leitha.

KALENDAR. See **CALENDAR**.

KALENDERI, in *Hindoo Mythology*, a daughter of Surya, or the Sun; spoken of also as a water nymph. She is one of the eight wives of *Krishna*, which see.

KALENDS. See **CALENDS**.

KALF, in *Geography*, a town of Sweden, in West Gothland; 45 miles S. E. of Gotheborg.

KALFSKAR, a small island on the east side of the gulf of Bothnia. N. lat. $62^{\circ} 34'$. E. long. $20^{\circ} 53'$.

KALFVEN, a small island on the west side of the gulf of Bothnia. N. lat. $61^{\circ} 3'$. E. long. $17^{\circ} 7'$.

KALGAGICHA, a town of Russia, in the government of Archangel; 40 miles S.S.W. of Oueg.

KALGAPOL, a town of Hindoostan, in Dowlatabad, on the Beemah; 12 miles S.W. of Naldourouk.

KALGUEV, an island in the Frozen sea, about 140 miles in circuit; 240 miles N.N.E. of Archangel. N. lat. $68^{\circ} 20'$ to $69^{\circ} 18'$. E. long. $45^{\circ} 30'$ to $47^{\circ} 30'$.

KALHAT, **CALHAT**, or *Calagate*, a town of Arabia, in the province of Oman, at the mouth of a river of the same name, which runs into the Arabian gulf; 80 miles S.E. of Maskat. N. lat. $23^{\circ} 10'$. E. long. $58^{\circ} 25'$.

KALHAT, Cape, or *Ras Kalhat*, a cape on the E. coast of Arabia. N. lat. $23^{\circ} 18'$. E. long. $58^{\circ} 30'$.

KALI, in *Agriculture*, the common name of a plant of the sea kind, which affords a saline matter by incineration, which, in many sorts of soil, is employed with great advantage as a manure, in combination with other substances. See **QUERCUS Marina**, and **SEA-WEED**.

KALI, in *Botany*, Toura. Inst. 247. t. 128, an Arabic name. (See **SALSOLA**.) The same appellation has been given to various succulent alkalescent plants.

KALI, in *Chemistry*. See **CARBONAT of Potash**, and **ALKALI**.

KALI, in the *Materia Medica*. See **SALSOLA** and **SODA**, and also **ALKALINE**.

KALI, in *Hindoo Mythology*, a name and form of the goddess Parvati, consort of Siva, in his character of *Kal* or *Time*, which see. Under this name and form she is of a terrific appearance, and is thus described in Moor's *Hindoo Pantheon*, p. 151. "Maha-kali, or the Great Kali, black and dreadful, is encompassed by symbols of destruction: two of her hands seem employed in the work of death: of the other two, one appears pointing downwards, alluding to the universal havoc which surrounds her, while the other, pointing upwards, seems to promise the resurrection of nature by a new creation. She is represented without a crescent (the artificial measure of time), because it is unnecessary to her character as the hieroglyphic of eternity; but the belief of the Hindoos in successive destructions and renovations of the universe (see **KALPA**), accounts for her wearing a *mund mala*, or necklace of skulls, as emblems of those revolutions." In that work are many plates of this deity under various names, including Bhadra-kali, as well as Maha-kali. Kali is the Hindoo name of the Nile, in the vicinity of which the scene of some of the Puranas is laid; and they relate, indeed, that the river itself is but a transformation of Kali, which, in Sanscrit and other Indian languages, means *black*; as does Nila, another of her names, or rather *dark blue*: the following also are names of this multiform deity, and have a like meaning; Asita, Shyama, or Shyamala, Mekara, Anjanabha, Krishna. (*Ibid.* p. 155.) Other plates in the same work, representing the goddess, are thus described: "Plate 27. is taken from a brass cast deposited by the author in the museum at the India-house: it is eighteen inches high, including the pedestal, which is about a foot in diameter, six inches deep and hollow, as if intended to be fixed on something; and I was told such images are occasionally fastened on the top of the *rat'h*, a carriage dragged about the streets on certain festivals. Kali is said to assume this form to frighten sinners into repentance and virtue: her attitude seems a chacing one, assumed to cause immediate terror; her limbs bend; her hands are open, fingers lengthened into points, stretched out; a serpent forms her girdle; she is naked, except a scanty cloth, called *pira*, round her middle; her belly is empty, thin, and shrivelled; her breasts pendent, with long disgusting nipples; a serpent convolves round her neck, and, twining on her bosom, projects its head to support her protruded, long, rough tongue: her chin is peaked; immense teeth and tusks are fixed in her lipless gums; her nostrils and goggle eyes are distended and bloated; snakes form appropriate rings for her natty ears, being knotted in the pendent lobes, with their heads raised, and their hoods expanded; her hair is stiffened out, forming a frightful glory round her head, diverging to meet a wider glory that rises from a flower on each side, forming a support to the figure. The cast is of brass; and, however disgusting to the eye, is far from being devoid of merit: our engraving is taken from an exact portrait, and exhibits considerable expression." P. 159.

"Plate 28. is from a very fine bronze image, about a foot high, cast, I was informed, in the Carnatic. It was presented to me by a Brahman, and is, I think, on the whole, the most elegant and best finished figure in my possession. She is, in this form, called Bhadra-kali, Maha-kali, and by other names; also, being eight-handed, Ashtabuja. Two of her hands are empty, pointing upward and downward, in the position before noticed: one of her right hands holds something not unlike a caduceus, which, in the cast, it resembles more nearly than in the plate; its corresponding left hand the *Patra* (see **PATRA**) or cup: the

next right and left hands, a singular crooked sword, and a shield with an embossed flower or fruit: the superior right hand has an agricultural implement, called *nanga*; the left the cord *pas*, or *pass* (see **PASH**), to catch or strangle sinners with. Her fine person is full dressed, with a profusion of ornaments; between her full breasts a five-headed serpent uprears itself; she has a necklace of human heads; her earrings are elephants; and a row of snakes' heads peep over her coronet. Her forehead is marked either with Siva's third eye (see **VIRUPAKSHA**), or her own hieroglyphic; and her open mouth shows her teeth and tusks, giving her a fierce and threatening aspect." P. 160.

KALININA, in *Geography*, a town of Russia, in the government of Tobolsk, on the Tunguska. N. lat. 60° 56'. E. long. 106° 26'.

KALIPH. See **CALIPH**.

KALISCH, or **KALITZ**, in *Geography*, a city in the duchy of Warsaw, late the capital of a palatinate of the same name in Great Poland, or Western Prussia, situated on the Prosna, and surrounded with walls, towers, and morasses. This palatinate was also called the "palatinate of Gnesen," from the city of that name; 57 miles N.E. of Breslau. N. lat. 51° 50'. E. long. 18°. See **GNESEN**.

KALITVA, a town and district of Russia, in the government of Voronetz, situated on the rivulet Kalitva; which falls into the Don; 60 miles S.S.E. of Voronetz.

KALISTVENSKAIA, a town of Russia, in the country of the Cossacks, seated on the Donetz.

KALIYA, or **KALANAGA**, in *Hindoo Mythology*, a serpent slain by Krishna, who, being the Sun, corresponds in this, and many other instances, with Apollo, the slayer of Python, both of whom, according to Clemens, were adored at Delphi; and in like manner both Krishna and Kaliya find adorers in India, where, in honour of Krishna's triumph, games and sports are annually held, as the Pythian games were at stated times in Greece. Like the Pythian serpent in the temples of Apollo, Kaliya-naga enjoys also his apotheosis in those dedicated to Krishna; nor, says major Moor, in his *Hindoo Pantheon*, whence we have taken this article, "are arguments wanting toward identifying Serpentarius on our sphere with his formidable foe, and the theatre of the conflict, the river Yamuna, or Jumna, with the via lactea. So the variety of demons sent to annoy Krishna, are, perhaps, the allegorical monsters of the sky, attempting in vain to obstruct his apparent progress through the heavens, where other constellations are fabled as so many beautiful nymphs ready to receive him, and have given rise to allegories of his inconstancy." (See **KRISHNA**.) Other names of this mighty mythological serpent are, *Naga*, *Sesha*, and *Vasoky*, which see.

KALIYANA-RAYA, a name of Vishnu among the Hindoos, of whom there is, under this name, a statue at Barra, on the banks of the Euphrates, which is said to be carefully concealed from the sight of the Mahometans.

KALKA, or **KALKA-PIRA**, in *Geography*, a river of Chinese Tartary, which, though one of the smallest, gives name to the *Kalkas*. It rises in a famous mountain, called Suelki, or Siolki, which name may be applied to the ridge that separates the Kalkas from Chinese Dacuria, and which is 130 miles W. distant from Teiteicar. This river empties itself into the lake Coulan.

KALKALLY, a town of Hindoostan, in Dowlatabad; 20 miles E. of Nauder.

KALKAS, a tribe of Tartars, consisting formerly of more than six hundred thousand families, which inhabit the country that lies N. of the Mogul Tartars. Their country,

which stretches as far as the kingdom of the "Eleuthes," is near 300 leagues in extent from east to west. In this region was anciently situated, towards the 45th degree of N. latitude, the city of "Karakan;"—the seat of the empire of Tschinghis-kan, and of that of his successors. The Kalkas live in tents along the banks of the rivers which water their country; of which the principal, though they take their name from Kalka-pira, are the Kerlon, Toulou, Touy, and Salingué. The banks of these rivers are well inhabited, and they flow through extensive plains, which are covered with rich pastures: their waters are very wholesome, and abound with excellent fish, especially trout. The vast desert, called "Cobi," (which see,) occupies almost the whole southern part of the country of the Kalkas. The war which the king of the "Eleuthes" (see KALMUKS) carried on in 1688 against the Kalkas almost destroyed the whole nation. To avoid the pursuit of a superior enemy, they supplicated the assistance of the Chinese arms, and offered to submit to the empire. Kang-hi undertook their defence, conquered the king of the Eleuthes, and kept the Kalka Tartars under his dominion, after having conferred upon their princes different titles of honour.

KALKA-TARGAR, a country of Chinese Tartary, which contains one class of Mongul Tartars. N. lat. $41^{\circ} 50'$. E. long. $110^{\circ} 33'$.

KALKE, one of the Prince's islands, in the sea of Marmora; anciently called "Chalcitis," on account of its mines of copper, which have been long neglected. On this island are three large Greek monasteries.

KALKI, in *Hindoo Mythology*, is the name given to an expected *avatara*, or manifestation of the god Vishnu. (See V. *INDU*.) The incarnations of this deity are numerous; but ten of them are of more importance than the others, and are, for distinction, called the ten incarnations, *das-avatara*. Of these nine are past; in the tenth, or Kalki, Vishnu is to appear mounted on a white horse, with a drawn scymitar, blazing like a comet, to end the kali-yug, that is, the present, or iron age, preparatory to a renovation of the world with an era of purity, or satya-yug. (See YUG.) In pictures, this avatara is represented by a man leading a white-winged horse. It is also called kalenki and afwah; likewise said to mean a horse; but as kal is time, and in several dialects means both yesterday and to-morrow; or, more extensively, the past and future, it is surmised by the author of the *Hindoo Pantheon*, p. 188. that the name of kalki, applied to this ender and renovator of ages, may have some allusion to that idea, rather than be confined to the form in which he is to be manifested. See KAL and KALPA.

KALKISSEE, in *Geography*, a town of the island of Ceylon; 19 miles S. of Columbo.

KALKOON, or **TURKEY ISLANDS**, a cluster of small islands in the East Indian sea. N. lat. $6^{\circ} 15'$. E. long. $115^{\circ} 45'$.

KALL, a town of Sweden, in Jamtland; 42 miles N.W. of Osterfund.

KALLA, a small island on the east side of the gulf of Bothnia. N. lat. $64^{\circ} 20'$. E. long. $23^{\circ} 26'$.

KALLATMA, a town of Egypt; 15 miles N. of Cossair.

KALLERY, a town of Sweden, in the province of Smaland; 28 miles S.S.W. of Jonkioping.

KALLODRA, a town of Hindoostan, in Guzerat; 16 miles N. of Surat.

KALLSKAR, a small island in the N. part of the gulf of Bothnia. N. lat. $65^{\circ} 43'$. E. long. $23^{\circ} 36'$.—Also, a small island on the E. side of the same gulf. N. lat. $63^{\circ} 56'$. E. long. $22^{\circ} 43'$.—Also, another small island on the same

side of the gulf. N. lat. $63^{\circ} 50'$. E. long. $22^{\circ} 33'$.—Also, another small island on the same side of the gulf. N. lat. $63^{\circ} 26'$. E. long. $21^{\circ} 28'$.

KALLVIKEN, a small island in the N. part of the gulf of Bothnia. N. lat. $64^{\circ} 18'$. E. long. $21^{\circ} 7'$.

KALM, PETER, in *Biography*, a very celebrated naturalist, and pupil of Linnæus, the account of whose travels, from having been translated into English, is well known in this country. He was a native of Finland, and was born in the year 1715. Having imbibed a taste for the study of natural history, it appears that he pursued his inclination with much zeal and industry. His first researches were rewarded by the discovery of many new plants in Sweden, of which he gave some account to the botanical world between the years 1742 and 1746. He was particularly anxious to explore the virtues of plants, both with respect to their uses in medicine, and in the useful arts, so that planting and agriculture occupied some portion of his attention. His reputation as a naturalist caused him to be appointed professor at Abo, and in October 1747, he set out upon his travels, sailing from Gottenburg for America; but on account of a violent hurricane he was obliged to take shelter in a port of Norway, whence he could not depart till the ensuing February, when he proceeded immediately for London. From hence he went to North America, as we learn from his book; and having spent two or three years in exploring whatever was worthy of observation in that country, he returned to his professorship at Abo in 1751. The expences of this undertaking appear to have exceeded what was allowed him by the Academy of Sciences, so that our author was obliged to live rather penuriously upon his return. Yet we are informed that he found means to cultivate, in a small garden of his own, several hundred plants, for the use of the university, as there was no public botanical garden at Abo. "His discoveries in botany very materially enriched the *Species Plantarum* of his great master, and the Linnæan Herbarium abounds with specimens brought home by him, distinguished by the letter K." Haller enumerates a long list of tracts published by Kalm, and his inaugural dissertation appeared in the *Amanitates Academicæ* of Linnæus. He was originally intended for the ecclesiastical profession, but was drawn aside from this pursuit by attending the lectures of Linnæus on natural history, given in the university of Upsal. Indeed, it was through the recommendation of Linnæus that professor Kalm was fixed upon to undertake the voyage to North America. He afterwards made, at his own expence, a very extensive tour into Russia, the history of which never appeared in print, but which is supposed to have furnished considerable matter for the work of a Swedish writer, who published a book of travels in that kingdom. Kalm was a member of the Royal Swedish Academy of Sciences, and departed this life in the year 1779, aged 64. His collection of dried plants, made in his various journeys, and doubtless valuable for the purposes of botanical information, is said to remain in the hands of his family in a state of neglect. Hall. Bibl. Bot. Aikin. Gen. Biogr.

KALMIA, in *Botany*, a genus named by Linnæus in honour of his friend and pupil Peter Kalm, D.D. professor of Economy at the university of Abo. (See KALM.) Linn. Gen. 217. Schreb. 293. Willd. Sp. Pl. v. 2. 600. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. v. 2. 64. Juss. 158. Lamarck Dict. v. 3. 345. Illustr. t. 363. Gærtn. t. 63. —Class and order, *Decandria Monogynia*. Nat. Ord. *Bicornes*, Linn. *Rhododendra*, Juss.

Gen. Ch. Cal. Perianth inferior, small, permanent, divided into five, subovate, acute, roundish segments. Cor. of one petal, salver or funnel-shaped; tube cylindrical, longer than

the calyx; limb with a flat disk, the margin upright, five-cleft half way down; ten little horn-like cells projecting outwardly from the corolla, and surrounding it where the border is upright. *Stam.* Filaments ten, awl-shaped, slightly spreading, a little shorter than the corolla, at whose base they are inserted; anthers with two pores. *Pist.* Germen superior, roundish, furrowed, style thread-shaped, longer than the corolla, declining; stigma obtuse. *Peric.* Capsule somewhat globose, depressed, five-celled and five-valved. *Seeds* numerous.

Eff. Ch. Calyx in five deep segments. Corolla cup-shaped, with ten prominences. Anthers with two pores. Capsule with five cells.

1. *K. latifolia*. Broad-leaved Kalmia. Linn. Sp. Pl. 560. Curt. Mag. t. 175. Sm. Inf. of Georgia, t. 37.—“Leaves ovate-elliptical, ternate and scattered. Corymbs terminal.”—Professor Kalm relates that he found this species in various parts of North America, and especially in the province of Pennsylvania, on the sides of hills, and occasionally in woods, which were enlivened by its foliage when most other trees had lost their verdure. It was covered with a profusion of beautiful blossoms in the month of May.—*Stem* 10 or 12 feet high, branched. *Leaves* rigid, bright green above, pale beneath, on short footstalks. *Flowers* in a round bunch, sitting very close to the branch, of a pale blush-colour, variegated beautifully with crimson.

2. *K. angustifolia*. Narrow-leaved Kalmia. Linn. Sp. Pl. 561. Curt. Mag. t. 331.—“Leaves lanceolate. Corymbs lateral.”—A native also of North America, flowering from May to July.—*Stem* from three to six feet high, divided into small woody branches, covered with a dark grey bark. *Leaves* of a shining green colour above, paler beneath, obtuse, on short footstalks, placed without order, varying in breadth. *Flowers* in loose, lateral bunches, of a bright red colour when they first open, but afterwards fading to a blush or peach-colour.—There are two varieties of this species mentioned in the *Hortus Kewensis*, one with red, the other with pale flowers.

3. *K. glauca*. Glauous Kalmia. Willd. n. 3. Curt. Mag. t. 177. Ait. Hort. Kew. v. 2. 64. t. 8.—“Leaves opposite, oblong, smoothish, glauous underneath, revolute at the margin. Corymbs terminal. The little branches two-edged.”—Discovered by Sir Joseph Banks at Newfoundland, and introduced into this country in 1767. It flowers in April and May.—This *shrub* is about two feet in height. *Stems* branched, round, reddish-brown. *Leaves* embracing the stem, each furnished with a broad, longitudinal, yellowish rib. *Flowers* on very long stalks, about five or six in a bunch, of a beautiful pink or rose-colour.—It much resembles *latifolia* in habit, but is considerably smaller, and of more humble growth.

4. *K. hirsuta*. Hairy Kalmia. Willd. n. 4. Curt. Mag. t. 138.—“Leaves opposite and alternate, elliptical, hairy. Flower-stalks axillary, single flowered.”—A native of South Carolina, in a swampy soil. It flowers in the autumn.—*Stem* upright, slender, about three feet in height, branched. *Leaves* small, bright-green, numerous. *Flowers* purplish, axillary, each growing on a single stalk, though inaccurately described by Curtis and Martyn as being racemose. The general appearance of this species is somewhat similar to that of *Andromeda Deboecii*.

This whole genus is remarkable for its elegant flowers and foliage. It thrives well in a boggy soil, and is a general favourite in all gardens.

KALMIA, in *Gardening*, comprehends plants of the hardy evergreen shrubby kinds; of which the species mostly cultivated are, the broad-leaved kalmia (*K. latifolia*); the nar-

row-leaved kalmia (*K. angustifolia*); the glauous kalmia (*K. glauca*); and the hairy kalmia (*K. hirsuta*).

The value of the first sort, which is an elegant shrubby plant, is much lessened by its noxious properties.

In the second kind, there are varieties, with pale and deep red flowers, differing in their habit; the latter, the most humble of the two, not only produces the most brilliant flowers, but in greater abundance. This is said to be poisonous to sheep and cattle in its native situation, America.

Method of Culture.—These different plants are capable of being increased by seeds, layers, and suckers from the roots. But the first sort is most commonly raised from the seeds, which are procured from America, and sown in pots or boxes filled with light sandy mould, in the spring season, and plunged in an easterly border, or in beds of light mould, in the same aspect. However, when placed in a gentle hot-bed they succeed much better. They must, notwithstanding, be inured to the full air of the atmosphere during the summer season, having shelter in the winter from frost. As soon as the plants have had two years growth, they may be removed into separate pots, in order to be continued two years longer or more; when they may be planted out where they are to remain, in warm situations in the open ground.

The second species is mostly increased by layers, which should be made from the young shoots, and laid down in the early autumn. In a year or two, when they are become well rooted, they may be taken off, and planted separately in pots filled with bog earth, or in a warm border formed of the same sort of soil. This is a more hardy kind than the former.

The third kind is mostly increased in the same manner as the first, and demands a similar method of treatment.

The fourth is capable of being raised from layers, but the plants are preserved with difficulty in this climate.

Almost all the plants are likewise capable of being increased by suckers; which should be taken off, and planted out in the spring, in nursery rows, for two or three years, after which they may be removed to the places where they are to grow.

In the more hardy sorts, these plants afford ornament and variety, when properly placed in the fronts of clumps and shrubbery borders; and in those which are tender, in mixture with other potted, green-house, and other similar plants.

KALMOUA, in *Geography*, a town of Prussia, in the circle of Natangen; 12 miles S.S.E. of Marggrabowa.

KALMUCKS, OEOLOETS, or *Eleuthes*, a tribe of Tartars, who affirm their home to have been between the Kokonor or Blue lake, and Thibet. Long before Tschingis-khan, according to the old reports of these people, the greatest and mightiest part of the Oeloets made a military expedition westward as far as the Lesser Asia, and there lost themselves among the mountains of Caucasus; but the rest, who had staid behind in Great Tartary, received from their Tartarian neighbours, the name Khaimak (the separated). In fact they call themselves also Khalmik, though Oeloet is always their peculiar denomination, which word likewise denotes a separated, disjoined, or distinct nation. The Oeloets divide themselves, at least since the destruction of the Mongolian monarchy, into four main shoots, who denominate themselves Khoschot, Derbet, Soongarr, and Torgot; and from the time of their separation from the Mongoles or Monguls, they have been uniformly subjected to various princely families. The major part of the “Koschotan” Kalmucks are said to have remained in and about Thibet and on the Kokonor, and after the downfall of the Soongarian power they have been under the protection of the Chinese. The

smaller

smaller part of this stock had long before withdrawn to the banks of the Irtysh, and at length fell under the dominion of the Soongarian horde, with which it took part in the wars against China, and was also dispersed at the same time with the Soongarians. Those under the Chinese sovereignty, the still united horde of the Khoshotes, are estimated at 50,000 heads. They are reported to have had their name, which implies warrior or hero, from the courage they displayed under Tschingis; and from this circumstance, as well as their deriving their princely race in uninterrupted succession from the brother of the great Tschingis, they maintain a superiority of rank above the other Kalmuck hordes. The number of Khoshotes subject to Russia is but small. In the year 1675 there came 1500, and in 1759 an additional 300 families to the shores of the Volga, where they settled and voluntarily submitted to the Russian sovereignty. The "Soongares," at the separation of the Mongolian monarchy, formed but one stock with the Derbetans, who afterwards parted, under two discordant branches of their princely family. This horde, in the 17th and beginning of the 18th century, reduced to their subjection a great part of the other Kalmuck races, particularly the Khoshot, Derbet, and Kho-it, and waged bloody wars with the Mongoles as well as with the Chinese empire itself, but which ended in their total subjugation and dispersion. Previously to this unhappy period, they, together with the Derbets, reckoned upwards of 50,000 fighting men, and were deemed the bravest, richest, and most powerful horde. They resided formerly about the Balkhash lake and its rivers Tschuy and Ily; and their most flourishing period was between the years 1696 and 1746. The towns of the eastern Bucharja and the Great Kirghise horde were about this time tributary to them. Many of the Soongarians dispersed themselves in the interior parts of Asia and quite into the Usbeck towns; some thousands of them fled into Siberia; and most of them accommodated themselves to the Chinese sovereignty, and from their own statements, it appears, that scarcely 20,000 families of them and the Derbetan nation are now remaining. The number of the Soongares, who at that time (1758) took refuge in Russia, amounted to about 20,000 heads; they were united with the Volgaic Kalmucks, but for the most part returned with them again in the year 1770 into the Soongarèy. The "Derbetans," who at first had their pasturages in the region of the Koko-noor, removed thence, on account of the Mongolian disturbances, towards the Irtysh, and, on that occasion, split into two parties. One of them united with the Soongares, in whose fortunes and final dissolution it was involved; and the other proceeded westward with the Torgots towards the Yaik (now Ural) as far as the Volga and the Don, where it completely settled. In 1723 they removed to the parts beyond the Don; and afterwards joined the Torgots on the Volga. The "Torgots" seem to have formed themselves into a particular horde much later than the other Kalmuck branches. Removing from the restless Soongares, they marched westward to the Steppes on the Volga, and there settled, receiving from the Russians the appellation of the Volgaic Kalmucks. In the year 1761 the Russian government came to an agreement with this rich and powerful horde, which restricted the authority of the khan to narrower bounds, and excited such discontents, that they returned in great numbers in 1770 and 1771, over the ice of the river Ural, across the Kirghisian Steppe, into the Soongarèy. The whole amount of the Kalmucks that remained in Russia was estimated, some few years ago, at somewhat more than 20,000 tents. These are the remains of all the four hordes; but the Khoshotes, the Soongares, and Torgots, who re-

mained and are distributed among the Derbets, have, besides several petty princes, a khan presiding over them. They wander, with their flocks and herds, in the steppes between the Don and the Volga, from the line of Tzaritzin as far as Caucasus; and between the Volga and the river Ural, from the Irghis quite to the Caspian; that is, in the governments of Saratof and Astrachan, and in the seats of the Cossacks of the Don. In addition to these there is still a numerous colony of "baptized Kalmucks." Towards the close of the 17th century, many, among the distinguished and noble, professed themselves of the Christian faith. In the year 1737 the government established them in a fruitful region about the rivers Samara, Sok, and Tok (in the present government of Simbirsk and in the Orenburg district of the government of Ufa), and granted them also the city of Stavropol, which is now a chief town of the government of Simbirsk. The increase of this colony was so considerable, that in the year 1771 they could reckon nearly 14,000 heads, whereas in 1754 they were only 8695. There is yet subsisting in the government of Ufa a small colony of "Mohammedan Kalmucks," which originated from individual profelytes made by the Kirghises and adopted by that body.

The Chinese empire has been lately extended in Tartary by the celebrated conquest of the kingdom of the Eleuthes, made in 1759 by the arms of the emperor "Kien-Long," who had been 46 years on the throne of China. The whole nation of the Eleuthes, known in Europe and Russia by the name of Kalmucks, may be divided (says Grosier) into three branches, which have all proceeded from the same stem. The most westerly (now the most numerous and powerful) occupy the country contained between the Caspian sea, Muscovy, Samarcand, and Cashgar, and which extends towards the east as far as a vast chain of mountains, supposed to be a continuation of Caucasus. Every year during winter these Tartars encamp on the shore of the Caspian sea, near Astrachan, where they carry on a great trade. The second division of the Eleuthes inhabit to the east, from the chain of mountains now mentioned, as far as another chain of lofty mountains, the most considerable of which are called "Altai," in which are the sources of the Oby and Irtysh. The country which these people inhabit is very extensive; since it borders on the north with Muscovy, and on the south with the territories of the Usbeck Tartars; these are the people whom Kien-Long has constrained to submit to the Chinese government. The third branch of the Eleuthes inhabit to the west of China; they are the Tartars of Kokonor, who have been for a long time subjects of the empire. They are separated from the province of Chen-si by lofty mountains. They take their name from a lake in this country, called in their language "Kokonor," and which is one of the largest in Tartary. They are subject to eight princes, who are independent of each other, and who are all of the race of the khan of the Eleuthes Tartars. These people derive their principal riches from the gold which is found mixed with the sand of their rivers, and above all with that of "Altangkol," or the Golden river. The gold-dust which it furnishes is the principal revenue of the princes of Kokonor, who employ their vassals during summer in collecting it. One of the principal articles of the trade of Kokonor is a kind of napped woollen stuff, called "pou-lou;" it is manufactured by these Tartars, who have the art of dyeing it in different colours; long dresses are made of it in the country, and it is generally used at Pe-king for covering seats. The famous Hoang-ho, or the Yellow river, has its source in this corner of Tartary.

The Kalmucks of Asiatic Russia are divided into three ranks;

ranks; the nobility, whom they call white bones; the common people, who are bondmen, and denominated black bones; and the clergy, descending from both, who are free. In like manner, the noble ladies are called white flesh; and the common women black flesh; but pedigrees are only reckoned by the bones. The power of the "Taidsha," or chief prince, consists solely in the number and opulence of his subjects; territory being of no estimation in so wide a region. These subjects form an "Olufs," divided into "Imaks," from 150 to 300 families; each Imak being commanded by a "Saiflan," or noble. If there be a great khan, or emperor, the princes are only guided by him in affairs of general importance. The tribute is about a tenth part of the cattle, and other property; but on the first summons every man must appear on horseback before the prince, who dismisses those who are unfit for the fatigues of war. The weapons are bows, lances, and sabres, and sometimes fire-arms; and the rich warriors are clothed in mail of interwoven rings, like that used in Europe till the 15th century. But they cannot oppose regular armies, and are apt even to disorder that of their allies. Tooke's View of the Russian Empire, vol. i. Grosier's China, vol. i.

KALMUNZ, a town of Bavaria, in the principality of Neuburg, at the conflux of the Vilz and the Nab; 12 miles N.N.W. of Ratibon.

KALNICK, a town of Russian Poland, in the palatinate of Braclaw; 16 miles E.N.E. of Braclaw.

KALO, a town of Hungary, fortified with a moat and bastions; 21 miles S.E. of Tokay.

KALOMBA, a town on the N. coast of the island Cumbava. S. lat. 8° 9'. E. long. 118°.

KALOUKE, a town on the W. coast of the island Celebes. S. lat. 2° 11'. E. long. 119° 15'.

KALPA, in *Hindoo Chronology*, an imaginary period, at the end of which all things are absorbed in the Deity; it seems to mean a creation or formation. "The Hindoos say that it has been revealed, that from the beginning to the end of things, when the whole creation will be annihilated and absorbed into the Supreme Being, there will be five great kalpas, or periods. We are now in the middle of the fourth kalpa, fifty years of Brahma being elapsed, and of the remainder the first kalpa is begun. These five great kalpas include five hundred years of Brahma; at the end of which nothing will remain but Brahm, or the Self-existing. Every kalpa, except the first, is preceded by a renovation of the world, and a general flood. These five kalpas have five deities, who rule by turns; and from whom the kalpas are denominated. These five deities are Devi (or Parvati), Surya or the Sun, Ganesa, Vishnu, and Isvara or Siva. Brahma has no particular kalpa: he is intimate to them all. Each deity, in his own period, is called Kalfva-rupi, meaning with the countenance of Kal, or Time; or Chronus, as western mythologists would say; they having several ruling deities of that name. We are now under the reign of the fourth, Chronus, or in the kalpa of Vishnu; who to create, thought on Brahma to preserve; he fosters the whole creation in his own character, and he will ultimately destroy it through the intervention of Rudra, or Siva. It is declared in the Puranas, that all animals and plants are the linga or phallus of the presiding Kalfva-rupi deity, and that at the end of his own kalpa, he is deprived of his ling by his successor, who attracts the whole creation to himself, to swallow it up, or devour it, according to western mythologists; and at the end of his kalpa he disgorges the whole creation. Such is the origin of Chronus devouring his own offspring; of Jupiter disgorging it, through a potion administered to him by Metis, and of Chronus castrating his own father."

Moor's Hindoo Pantheon. (See KAL.) We shall extract no farther on this abstruse point of Hindoo metaphysics, in the consideration of which great difficulties are necessarily interposed.

KALPA-DRUMA, the name given by Hindoo fabulists to a tree, situated in the garden of Indra, called Nandana, which, as well as others, yield all that is desired of it. See INDRA.

KALSCHARPOVI, in *Geography*, a town of Russia, in the government of Ufa; 28 miles S.E. of Burguruslawsk.

KALSOE, one of the Faroer islands.

KALTENBERG, a town of Bohemia, in the circle of Koniggratz; 20 miles N.W. of Gitschin.

KALTENBRUNN, a town of the duchy of Courland; 24 miles E. of Seelburg.—Also, a town of Bavaria, in the principality of Sulzbach; 12 miles N.E. of Sulzbach.

KALTENSTEIN, a town of the bishopric of Passau; 10 miles N. of Passau.

KALTHOF, a town of Prussia, in the province of Smaland, near Konigsberg.

KALUA, a town of Prussia, in Pomerelia; 8 miles E. of Marienburg.

KALUADA, a town of the Arabian Irak, on the Tigris; 10 miles S.E. of Bagdad.

KALUBBLUB, a small island in the East Indian sea, near the S.W. coast of Mindanao. N. lat. 6° 46'. E. long. 121° 32'.

KALUGA, a city of Russia, and capital of a government, called "Kalatskoe," or "government of Kaluga," situated on the Occa; a place of considerable trade, and one of the most populous between Cherfon and Moscow. N. lat. 54° 28'. E. long. 36° 2'.

KALVOLA, a town of Sweden, in the province of Tavastland; 12 miles N.W. of Tavasthus.

KALUOT, a small island on the E. side of the gulf of Bothnia. N. lat. 63° 21'. E. long. 21° 39'.

KALUTSKOE, or *Government of Kaluga*, a government of Russia, bounded on the N. by that of Moscow, E. by those of Moscow and Tula, S. by Orlovskoe, and W. by Smolenskoe, about 140 miles long, and from 30 to 90 broad, divided into 12 districts. See KALUGA.

KAMA. See KAMMA.

KAMA, a small island in the N. sea, near the coast of Lapland; 10 miles N. of Suroe.

KAMA, in *Hindoo Mythology*, is the god of love. "The Hindoo god," says sir W. Jones, "appears evidently the same with the Grecian Eros, and the Roman Cupid; but the Indian description of his person and arms, his family, attendants, and attributes, has new and peculiar beauties. According to the mythology of Hindoostan, he was the son of Maya, or the general attracting power, (see MAYA,) and married to Reti, or Affection; and his bosom friend is *Va-santa*, or Spring. (See these articles.) He is represented as a beautiful youth, sometimes conversing with his mother and consort in the midst of his gardens and temples, sometimes riding by moonlight on a parrot, or *luri*, and attended by dancing girls or nymphs, the former of whom bear his colours, which are a *fisz* on a red ground. His favourite place of resort is a tract of country round Agra, and principally the plains of Matra; where Krishna also and the nine Gopea (see KRISHNA), who are clearly the Apollo and Muses of the Greeks, usually spend the night, in music and dancing. His bow of sugar-cane or flowers, with a string formed of bees, and his five arrows, each pointed with an Indian blossom of a heating quality, are equally new and beautiful. He has more than twenty names: that of Kam, or Kama, signifies

signifies desire, a sense which it also bears in ancient and modern Persian." Kamdeo is a more popular way of expressing his name. He is also called Makara-ketu, alluding to the fish in his banner, which is said to be the name of the horned shark: Makara is also the zodiacal sign Capricorn. Kandarpa, meaning *love*, is another of his names; and Pushpa-danva, or with a *bow of flowers*. Mara is another. Ananga means the incorporeal, derived from a very popular fable of Kama having been reduced to a mental essence by Siva; thus related in the Ramayana, b. i. sect. 22. "Kandarpa, the wily one, wounding St'hanu, the lord of the gods, while, with uplifted arm, he was engaged in sacred austerities, met the desert of his crime from the eye of the great Rudra—all his members, being scorched with fire, fell from his body: he was thence called Ananga (bodiless) and the place where it happened Kama (desire)." His name of Smara, the ideal, may refer to his mother Maya, meaning illusion. Madan, Madamat, and Makadamat, major Moor, from whose Hindoo Pantheon this article is taken, deems derived from a root signifying *sweetness* and *intoxication*, or pleasurable merriment, but not approaching to drunkenness. Kama is said to have been the son of Krishna and Rukmeni, that is, incarnated in a son of theirs, and then named Pradyamna, the adventures of whose son Anirudha with the beautiful Usha are the subject of a pretty tale, and a very interesting drama.

The banner of Kama, a fish on a red ground, and his *vahan*, or vehicle, the parrot, or *luri*, have doubtless their allusions; the former possibly, as major M. conceives, to the stimulating nature of that species of food stirring the blood to aid Kamdeo's ends; and perhaps the ensanguined colouring, and extreme beauty of the *luri*, and, like the fish (and the dove of western mythologists) its supposed *aphrodisiac* tendency as food, may have had a share in guiding a selection of attributes for the ardent deity. The soft affection and fabled constancy of the dove may have weighed with the Greeks; although constancy may not, perhaps, in strictness, be a characteristic of love.

Sir William Jones has addressed a spirited hymn to this deity. The following stanza describes Vafanta preparing the bow and shafts for his mischievous friend. The flowers with which the five arrows are tipped are of a heating inflaming quality, denoting that it is through the senses that love's shafts are felt.

"He bends the luscious cane, and twists the string
With bees; how sweet! but ah! how keen their sting!
He with five flow'rets tips thy ruthless darts,
Which through five senses pierce enraptured hearts:
Strong Champa, rich in odorous gold;
Warm Amer, nurs'd in heavenly mould;
Dry Nakefer, in silver smiling;
Hot Kitticum our sense beguiling;
And last, to kindle fierce the scorching flame,
Lovehaft, which gods bring!—Bela name."

The Champa or Chumpa, or more correctly Champaka, is a polyandrian polygynian flower, the *micheha* of European botanists; it is of two sorts, white and yellow; small, and in its foliage like an expanded rose-bud. Gardeners make and expose for sale, chaplets and long strings of the blossom, which loose women, on the supposition that its fragrance excites favourable sensations in the votaries of Kama, decorate their hair with, and wear round their necks: its fragrance is, however, so potent, that nerves unaccustomed to it can scarcely bear it within doors. Another flower, called *magry*, is of the same description, and may, perhaps, be one of those classically named in the hymn. The odour of the champa

is so strong, that bees are said not to extract honey from it; a circumstance that could not escape the keen eye of the Hindoo poets, and they accordingly imagine the champa to be sadly mortified at the neglect. They have, however, consoled it by dedicating it to Krishna, the black deity; as they, contrary to the notion of some European naturalists, consider the union of yellow and black as peculiarly beautiful. The champa is farther consoled by the preference it has obtained in bedecking the glossy locks of black-haired damsels, as just noticed; and in the following stanza, literally translated from the Sanscrit:

"That thou art not honoured by the ill-disposed bee, why, O Champaka! dost thou so heavily lament. The locks of lotus-eyed damsels, resembling the fresh dark clouds adorning the sky; let these embellish thee."

The Amer, mentioned in the extract from the hymn, is also called *amra*, and *amla*, and is said by some to be the *mango* flower. Dry Nakefer is a handsome flower with white and yellow petals. The Bela is a beautiful species of jasmine.

Among a refined people, advantageously situated in a low latitude, we naturally expect to find love, in all its vast variety of relations, no inconsiderable proportion of their occupation and amusement. Books and tales on amatory topics are very abundant in India, and in common life allusions are constantly occurring to Kama and his excitations. The ode, translated from the Sanscrit, with which we shall conclude this article, is a popular canticle on a festival held at the full moon of the month Chaitra, in honour of Kamadeva, attended by music, bathing, and festive jollity. It must be recollected that Kama was incarnated as a son of Krishna, who being Vishnu is called by one of his names, Madhava, in the second stanza. The three first stanzas consist chiefly of compound words forming names of Kama, for instance, Pushpa-danva, with a flowery-bow; Makaraketa, fish-bannered, &c.

1. "Hail, god of the flowery bow! Hail, warrior, with a fish on thy banner! Hail, powerful divinity, who causeth the firmness of the fage to forsake him, and subdueth the guardian deities of the eight regions!

2. "O Kandarpa! thou son of Madhava. O Mara! thou foe of Sambara. Glory be to thee who lovest the goddess Reti: who springest from the heart.

3. "Glory be to Madana; to Kama; to him who is formed as the god of gods; to him, by whom Brahma, Vishnu, Siva, Indra, are filled with emotions of rapture!

4. "May all my mental cares be removed! all my corporeal sufferings terminate! May the object of my soul be attained, and my felicity continue for ever." Hin. Pan. p. 451.

KAMA-DHENU, } names of *Surabhi*; which see.
KAMA-DHOK, }

KAMAK, in *Geography*, a town of Turkish Armenia, on the Euphrates; 10 miles S.S.W. of Arzingen.

KAMAKURA, a town of the island of Nippon, in the gulf of Jedo. N. lat. 35° 10'. E. long. 139° 40'.—Also, an island of Japan, near the S. coast of Nippon, about three miles in circuit, having its coasts so precipitous, that a crane is used to raise the freight from the boats. This is used as a state prison.

KAMAL, or KAMALA, the Sanscrit name of the lotus, a plant esteemed by the Hindoos, as well as by the ancient Egyptians, as very sacred and mysterious. See LOTUS, or NYMPHÆA, or whatever word under which Egyptian superstition, connected with the lotus, may be noticed. We shall give a short article under LOTUS. An extensive class of Hindoo philosophers, being Neptunists,

tunists, look on this aquatic plant with profound reverence; being more especially the symbol of humidity; and Vishnu being a personification of water, his worshippers deem it his emblem also. It is farther the name of his consort Lakshmi, who, in her character of Venus, generally holds in her hand the lotus, the emblem also of beauty, and denoting her aquatic origin. (See LAKSHMI, and LOTUS.) There is no end of mythical symbolism connected with allusions to the lotus among Hindoo mythologists. Of these many occur in Moor's Hindoo Pantheon. See the index under Kamal and Lotus. Many engravings are likewise there given of this subject in various combinations.

KAMALADAN, in *Geography*, a bay on the S. coast of the island of Mindanao. N. lat. $7^{\circ} 21'$. E. long. 121° .

KAMALAVA, a town of Persia, in Chufistan; 25 miles W. of Tostar.

KAMALA-YONI, in *Hindoo Mythology*, a name of Brahma, derived, it would appear, from the symbols of Lakshmi and Devi, or Parvati, the consorts respectively of Vishnu and Siva. The kamal is the lotus, an emblem of female beauty, and a name of Lakshmi; and the Yoni, the *puendum mulibre*, most mysteriously contemplated by the votaries of Devi, as the mythical matrix of nature, and as her symbol. It does not, however, clearly appear why these terms or things should be conjointly applied to Brahma, the deities creative power. On the subjects of this article see KAMAL, LAKSHMI, LOTUS, LINGA, and YONI, in this work, which are amply discussed in the Hindoo Pantheon.

KAMALIA, in *Geography*, a town of Africa, in Manding, the inhabitants of which are partly Pagans and partly Mahometans. Mr. Park, in his return home, was taken ill of a fever in this town. This severe and dangerous sickness was owing to excess of fatigue, to vicissitudes of weather, and to the various hardships which he encountered, being sometimes plunged to the neck in rivers and swamps, and sometimes lost in woods and deserts, without shelter, clothing, or food. In this distressed condition, and whilst he was waiting for a caravan with which he might pursue his journey towards the Gambia, he was hospitably entertained by a worthy negro, whose name was Karfa Taura, who not only undertook, for the value of one slave, to be paid on his safe arrival at the Gambia, not only to conduct him safe to Pisania, but to accommodate him in his house until the time of the caravan's departure. During the long interval of six months, not a murmur escaped the lips of Karfa, or of any of his wives, at the trouble and expence which their inmate, who was confined more than a month to his mat (his only bed), brought upon them. To the kind attention, the tender solicitude, the cheerful assiduity, and unwearied hospitality of these poor pagans, Mr. Park declared that he was indebted, not only for his safe return to Great Britain, but also for the preservation of his life; and he gratefully acknowledges, that he made his friend Karfa but an inadequate return (though the best in his power), by presenting him, on their arrival at the Gambia, with double the sum which he had originally promised. Kamalia is distant about 40 geographical miles S. W. of Sibidooloo, and lies nearly midway between the Joliba and Senegal rivers. N. lat. $12^{\circ} 46'$. W. long. $6^{\circ} 25'$.—Also, a town of Africa, in the kingdom of Bambarra, on the Niger; 18 miles S.W. of Sego.

KAMAN, a town of Asiatic Turkey, in Caramania; 27 miles N. W. of Kaifarieh.—Also, an island in the Red sea. N. lat. $27^{\circ} 35'$.—Also, a town of Walachia; 16 miles S.W. of Rusei.—Also, the name given by Tavernier to the *Comban*, or *Commum*, of others, which is the

frontier town of the Carnatic, towards Golconda, near the source of the river Gondegama, or Gandlecomma.

KAMAN, in *Natural History*, a name given by many authors to a stone found about the burning mountains, and at some times used to engrave seals on. It is described as a white stone, variegated with several colours.

KAMARIS, in *Geography*, a town of Asiatic Turkey, in Natolia; 22 miles W. of Artaki.

KAMBALA, mountains of Thibet, between lake Jamdoo and the Sampoo river.

KAMBAMBA. See CAMBAMBA.

KAMBELE, a town of Persia, in the province of Meccran, on the sea-coast; 120 miles S. of Kidge.

KAMBERG, a town of Bohemia, in the circle of Kaurzim; 12 miles S. of Beneschov.

KAMCHADALS. See KAMSTCHATKA.

KAMEH, a province of Candahar, lying W. of Cabul, N. of Cabul river, nearly opposite to Jalalabad.—Also, a river of Asia, called *Cabul*; which see. It is formed of various streams that issue from the northern mountains, and join in the district of Kameh, whence the confluent river receives its name, and which it communicates to the Cabul river during the remainder of its course.

KAMEINOI, a town of Russia, in the government of Pskov; 12 miles S.E. of Opogka.

KAMEL, GEORGE JOSEPH, in *Biography*, a jesuit missionary, who lived at the end of the 17th century, and sent various plants from the Philippine islands to the botanists of Europe. See CAMELLIA.

KAMELEY, in *Geography*, a town of Africa, in Senaar; 60 miles S. of Gerri.

KAMEN, a town of the duchy of Warsaw; 12 miles S.E. of Gnesna.

KAMENI. See KAMMENI.

KAMENITZ, a town of Bohemia, in the circle of Bechin; 24 miles E. of Bechin. N. lat. $49^{\circ} 21'$. E. long. $14^{\circ} 56'$.—Also, a town of Moravia, in the circle of Iglau; 13 miles E. of Iglau.

KAMENIZ, a town of Bohemia, in the circle of Chrudim; 10 miles S. of Chrudim.

KAMENKA, a town of Russia, in the government of Tobolsk; 120 miles E. of Eniseisk.

KAMENOI, a town of Russia, in the government of Ochotk, at the northern part of the Penzinskai gulf, containing about 400 inhabitants; 16 miles S. of Oklansk.

KAMENSKAIA, a town of Russian Tartary, in the country of the Cossacks, on the Donetz; 122 miles N. of Azof.

KAMENSKOI, a town of Russia, in the government of Archangel; 124 miles S. E. of Kola.—Also, a town of Russia, in the province of Ekaterinburg, on the Iset; 40 miles S.E. of Ekaterinburg.

KAMERAN, an island in the Red sea, near the coast of Arabia, governed by a Dola, subordinate to the Dola of Lobeia: the soil is fertile, and it has a good harbour, which affords refreshment to vessels that touch at it in their voyage from the Indies to Jidda. N. lat. $15^{\circ} 6'$. E. long. $42^{\circ} 25'$.

KAMERIE, a town of Arabia, in the province of Yemen; 48 miles S. of Sa. de.

KAMERINA, a town of Poland, in the palatinate of Kiev; 12 miles S.E. of Czurkafy.

KAMERITZ, a town of Bohemia, in the circle of Bechin; 16 miles N. of Filtritz.

KAM-HI, in *Biography*, emperor of China, was the grandson of a Tartar prince, who conquered that country in 1644, and ascended the throne in 1661. He had a great attachment

attachment to the arts and sciences of the Europeans, and liberally patronized the missionaries. He was a good geographer, and directed the construction of many maps and charts, yet so vain was he of the country over which he governed, that he would never suffer a map of the world to be laid before him unless China was represented therein as the centre. He died at the age of 71, in the year 1722.

KAMI, in *Geography*, a town of Japan, in the island of Nippon; 20 miles E.N.E. of Jedo.

KAMIABA, a town of Africa, in Manding. N. lat. $12^{\circ} 32'$. W. long. $6^{\circ} 15'$.

KAMIAMACONDA, a town of Africa, in the country of Jemarrow. N. lat. $12^{\circ} 48'$.

KAMIEN, a town of Poland, in the palatinate of Volhynia; 34 miles N. of Lucho.—Also, a town of Lithuania, in the palatinate of Wilna; 64 miles E. of Lida.

KAMIENEC, a town of Lithuania, in the palatinate of Brzesc; 16 miles N.N.E. of Brzesc.

KAMIENTSCHIK, a town of the duchy of Warsaw; 36 miles E.N.E. of Warsaw.

KAMISHELER, a town of Circassia, on the coast of the Black sea; eight miles E.S.E. of Mamak.

KAMINIEC, a town of Russian Poland, and capital of the palatinate of Podolia, having a castle built on a rock, and one of the best fortified places in Poland. Below it runs the river Smetricz, which falls into the Dniester. It has a Polish and Armenian bishop resident in the city; and here are also held a court of justice and provincial diet. The episcopal see was founded in 1375. Its college formerly belonged to the Jesuits. The whole province is sometimes called "Kaminiec;" 100 miles W. of Braclaw. N. lat. $48^{\circ} 53'$. E. long. $26^{\circ} 45'$.

KAMIONKA, a town of Poland, in Volhynia; 48 miles N.N.E. of Zyromiers.

KAMIR, a town of Persia, in the province of Laristan; 60 miles E.S.E. of Lar.

KAMISCHIN, a town of Russia, in the government of Saratof, on the Volga; 80 miles S. of Saratof.

KAMITNICZA, a town of Poland, in the palatinate of Braclaw, near the Dniester; 54 miles S. of Braclaw.

KAMITSKI, a town of Japan, in the island of Ximo; 28 miles E.S.E. of Kokara.

KAMMA, a river of Russia, which is the largest of all those that unite their streams with the Volga. It rises in the government of Perme, from the western projections of the Ural chain, waters a small part of the government of Viatka, flows through a large tract of the government of Perme, forms the border between the governments of Viatka and Ufa, and at Laisheva, 60 versts below Kazan, falls into the Volga; having terminated a course of 1000 versts. By the Tartars it is called "Tsholman-Idel." For the transport of salt and iron, it is one of the most important rivers of the empire. This is chiefly effected by the Tchusslovaiya and the Belaiya, two rivers of considerable magnitude, flowing into it on the left. Beside these, the Kamma takes up a great number of other rivers, such as, on the left, the Kolva, the Yaiya, the Kofva, and the Ik; on the right, the Obva, the Okhau, and the Umyak. The Kamma, above the mouth of the Belaiya (which is of a whitish water), has a blackish wholesome water. It is mostly attended by a ridge of mountains, consisting of sand, gypsum, and marle, with forests of firs and oaks. It is tolerably well stored with fish; and they are reckoned better tasted than those of the Volga.

KAMMAGOJAH, a town of Africa, in the country of Quoja.

KAMMAH, a town of Asia, and capital of a district

in the kingdom of Birmah, on the Irawaddy; which carries on a large trade in teak timber, conveyed from hence to Rangoon; 15 miles N. of Prome.

KAMMENI, GREAT and LITTLE, two islands of the Grecian Archipelago, so called on account of the nature of the calcined substances of which they are formed; the name denoting "burnt;" whence they have obtained the appellation of *Burnt* islands. The first of these rose above the sea in a surprising manner, whilst the waters boiled up, and on account of its origin, which bordered on a prodigy, and which occasioned it to be consecrated by the ancients to the god of hell, it was denominated "Hiera." In the year 1743, during subterraneous commotions and convulsions, and various other terrifying phenomena, another island suddenly appeared above the surface of the waters. In order to distinguish it from the former, which is the larger, the Greeks have called it "Mikri Kammeni," or the Little Burnt island. These islands are within about three miles W. of Santorin. N. lat. $36^{\circ} 30'$. E. long. $25^{\circ} 24'$. The Great Kammeni, which is the more ancient, is covered with a thin stratum of dust, which allows a few herbs to grow upon it. The Little Kammeni, in which are visible fix craters, by which the volcano vomited forth the substances that compose it, is naked and barren. At the beginning of the last century a new islet appeared between the Great and Little Kammeni, about a league from Santorin. Its formation, accompanied with shocks of earthquakes, which were felt at Santorin, was gradual; and various circumstances attended it, which are minutely described by Sonnini in his "Travels in Greece and Turkey."

KAMNIG, a town of Silesia, in the principality of Neisse; 8 miles N.N.E. of Patzschkau.

KAMNITZ, or CHEMNITZ, a town of Bohemia, in the circle of Leitmeritz: the principal article of trade is the manufacture of stockings; 30 miles S.E. of Dresden. N. lat. $50^{\circ} 47'$. E. long. $14^{\circ} 32'$.

KAMO, a town of Japan, on the south coast of the island of Jedo.

KAMOETER, a small island in the East Indian sea. S. lat. $6^{\circ} 30'$. E. long. $132^{\circ} 5'$.

KAMOURASKAS, a town of Canada, on the right bank of the St. Lawrence. N. lat. $47^{\circ} 33'$. W. long. $69^{\circ} 40'$.

KAMRAJE. See CASHMERE.

KAMSCHEVSKA, a town of Russia, in the province of Ekaterinburg, on the Isset; 52 miles S.E. of Ekaterinburg.

KAMSCHLOV, a town of Russia, in the province of Ekaterinburg; 56 miles E. of Ekaterinburg.

KAMSIN, hot southerly winds of Egypt, where they are known under the general name of "winds of fifty days." (See EGYPT.) These winds have been mentioned by travellers under the denomination of "poisonous" winds, or, more correctly, "hot winds of the desert." By the Arabs of the desert they are called "Semoum," or poison; and by the Turks "Shamyela," or wind of Syria, from which is formed the "Samiel" wind. The heat of these winds is sometimes so excessive, that it may be compared to the heat of a large oven at the moment of drawing out the bread. When they begin to blow, the atmosphere assumes an alarming aspect. The sky, which at other times is clear in this climate, becomes dark and heavy; the sun loses its splendour, and appears of a violet colour. The air is grey and thick, and filled with an extremely subtle dust, which is universally penetrating. This wind increases gradually in heat, in proportion to its continuance; and its effects are felt by all animated beings. The lungs are contracted and become painful.

painful. Respiration is short and difficult, the skin becomes parched and dry, and the body is consumed by an internal heat. Large draughts of water afford no relief, nor can any thing restore perspiration. Marble, iron, water, though the sun no longer appears, are hot. The streets are deserted, and the dead silence of night prevails every where. The inhabitants of towns and villages shut themselves up in their houses, and those of the desert in their tents, or in pits dug in the earth, waiting the termination of this destructive heat. It usually lasts three days, but if it exceeds that time, it becomes insupportable. The danger is most imminent when it blows in squalls, for then the heat is so much increased, as to cause sudden death by suffocation. This wind is peculiarly fatal to persons of a plethoric habit, and to those that are exhausted by fatigue. The corpse manifests signs of that putrid fermentation, which takes place in animal bodies when the humours become stagnant. These accidents are to be avoided by stopping the nose and mouth with handkerchiefs; and the camels bury their noses in the sand, and keep them there till the squall is over. Another quality of this wind is its extreme aridity; which is such, that water sprinkled on the floor is evaporated in a few minutes: it withers and strips all the plants, and exhales too suddenly the emanations from animal bodies, and produces that feverish heat which results from suppressed perspiration.

These hot winds are not peculiar to Egypt, they blow likewise in Syria; more frequently, however, near the sea, and in the desert, than in the mountains. M. Niebuhr met with them in Arabia, at Bombay, and in the Diarbekir: they are also known in Persia, and in the east of Africa, and even in Spain, and though their direction may vary, their effects are similar. In Egypt, the most violent proceed from the S.S.W.; at Mecca, from the E.; at Surat, from the N.; at Bassora, from the N.W.; from the W. at Bagdad; and in Syria from the S.E. They always proceed, says Volney, from desert continents; and he adds, it is natural that the air which covers the immense plains of Lybia and Arabia, meeting there with neither rivulets nor lakes, nor forests, but scorched by the rays of a burning sun, increased in intensity by the reflection of the sand, should acquire a prodigious degree of heat and aridity; hence he infers that these qualities are owing to the heat of the sun upon the sands. Volney's Travels in Egypt, &c. vol. i.

KAMTSCHATKA, a river of Russia, in the peninsula of that name. See below.

KAMTSCHATKA, a peninsula of Russia, in the government of Irkutsk, deriving its name from the river Kamtschatka, which is supposed to have been so called from some brave warrior named Konfata. It is bounded on the N. by the province of Ochotsk, on the E. and S. by the Northern Pacific ocean, and on the W. by the sea of Ochotsk, and the Penhinskoe gulf. On the southern promontory, the Kurilly islands are included in it, and towards the west it is connected with North America by the Aleutan islands. This country consists of a chain of mountains, forming one train with the very mountainous and rocky islands of Kurilly and Japan, and these again seem to be connected with the mountains that reach from Thibet through China. All these countries and islands seem to have arisen by subterraneous fires, which still continue to act, much more lately than Siberia. The peninsula of Kamtschatka, according to the account given of it by captain King, who visited it in October 1779, lies on the eastern coast of Asia, running nearly N. and S. from 52° to 51 N. lat.; the longitude of its southern extremity being 156 45' E. The isthmus which joins it to the continent on the N. lies between the gulf of Olutorfk, and the gulf of Penhinsk. Its southern extremity is cape Lopatka, a

word signifying the blade-bone of a man, and so called from its supposed resemblance to it. The shape of the whole peninsula is not unlike that of a shoe, widening from the toe, that is cape Lopatka, towards the middle, and again narrowing towards the heel, the neck of land above-mentioned connecting it with the continent. Its greatest breadth is from the mouth of the river Tigil to that of Kamtschatka, and is computed to be 236 miles, from whence it narrows very gradually towards each extremity. It is bounded on the N. by the country of the Koriaks, from which it is separated, according to the Russian geographers, by Olutorskoi-nofs, which is the southern boundary of the Koriaki country. A chain of high mountains stretches through the whole length of the country from N. to S.; dividing it nearly into two equal parts, from which a great number of rivers take their rise, and empty themselves, on each side, into the Pacific ocean, and the sea of Ochotsk. There are three rivers of much greater magnitude than the rest; the "Bolchoireka," or great river, the "Kamtschatka," and the "Awatka." The first discharges itself into the sea of Ochotsk, and is navigable for the Russian galliots, upwards of five leagues from its mouth, or within nine miles of Bolcheretsk, a town situated at the conflux of the Goltsofka and the Bistraia, which here lose themselves in the Bolchoireka. The Bistraia, which is no inconsiderable river, has its source in the same mountain with the Kamtschatka, and, by taking a direct contrary course, affords the Kamtschadales the means of transporting their goods by water, in small canoes, almost across the whole peninsula. The river Kamtschatka, after pursuing a course of nearly 300 miles from S. to N., winds round to the eastward, in which direction it empties itself into the ocean, a little to the southward of Kamtschatkoi-nofs. Near the mouth of the Kamtschatka, to the N.W. lies the great lake, called Nerpitsch, from "nerpi," a Kamtschadale word, signifying a seal, with which this lake abounds. About 20 miles up the river, reckoning from the mouth of the lake, is a fort called Nishnei Kamtschatka Ostrog, where the Russians have built an hospital and barracks, and which is said to have become the principal mart in this country. The river Awatka rises from the mountains situated between the Bolchoireka and the Bistraia, and running, from N.W. to S.E., a course of 100 miles, falls into the bay of Awatka. The Tigil is likewise a river of considerable size, rising amidst some very high mountains, which lie under the same parallel with Kamtschatkoi-nofs, and running in an even course from S.E. to N.W. falls into the sea of Ochotsk. The soil of this peninsula is extremely barren, and seems to be incapable of profitable cultivation, either in the way of pasturage, or in any other mode.

The face of the country, in general, is thinly covered with stunted trees, having a bottom of moss, mixed with low weak heath, and bears a more striking resemblance to Newfoundland than to any other part of the world which Capt. King had ever seen. He was informed, however, by major Behm, the late governor, that many parts of the peninsula, particularly the banks of the river Kamtschatka and the Bistraia, produce grass of great height and strength, which they cut twice in the summer; and that the hay is of a succulent quality, and particularly well adapted to the fattening of cattle. From other accounts it appears that there is no part of the country equal in fertility to that which borders on the river Kamtschatka; and that to the N. and S. it is much inferior both in point of soil and climate. Repeated experiments have been made in the culture of oats, barley, and rye, in different quarters near this river, which have generally succeeded; and it is not doubted, that wheat, in many parts, particularly near the source of the Bistraia and

and Kamtschatka, would grow as well as in the generality of countries situated in the same latitude. The fertility of this part of the country may probably be owing to its being the widest interval of the peninsula, and consequently most remote, on each side, from the sea: whereas the chilling fogs and drizzling weather, which prevail almost perpetually along the coast, must necessarily render the parts adjacent very unfit for all the purposes of agriculture. The severity of the climate, we may naturally conclude, must correspond to the sterility of the soil, of which it is probably the cause. The first time, says Capt. King, we saw this country, was in the beginning of May 1779, when the whole face of it was covered with snow, from six to eight feet deep. On the 8th of May, at noon, the thermometer stood at 32° ; and the snow lay so deep on the ground, that all attempts to cut wood were fruitless. On the 12th the thaw began to advance gradually; and in the beginning of June, the snow was generally melted from the lowlands. On the fifteenth of this month, the thermometer had never risen higher than 58° , nor the barometer than $30^{\circ} 4'$. The S. E. wind was the most prevalent. On the 24th of August, the foliage of the trees and all sorts of vegetation seemed to be in the highest state of perfection. During this month and September, the weather was very changeable, but in no respect severe. The winds veered towards the west. The greatest height of the thermometer was 65° , the lowest 40° . The barometer's greatest height 30 ; its lowest $29^{\circ} 3'$. So that, upon the whole, during this month, an equal and moderate degree of temperature prevailed. But at the beginning of October, the tops of the hills were again covered with new-fallen snow, the wind continuing westerly. In computing the seasons, the spring should not be taken into the account. The interval from the middle of June to the middle of September may properly be said to constitute the summer. October may be considered as an autumnal month; and from thence, to the middle of June, it is perfect winter. It is said that the climate, in the country adjoining to the river Kamtschatka, is not less serene and temperate than in many parts of Siberia that are under the same latitude. This variation, says Capt. King, is probably owing to the same causes, to which the superior fertility of the soil in those parts has been attributed.

The ingenious Mr. Kirwan, in his "Estimate of the Temperature of different Latitudes," states the distance of Kamtschatka from the Atlantic to be such, that its temperature is not in any respect influenced by it, but rather by that of the North Pacific, to which it adjoins. Accordingly the northern parts of this peninsula enjoy the most moderate weather, being chiefly influenced by the North sea, the temperature of which, even in winter, is milder than that of the sea below the straits that separate Asia from America. Speaking of the temperature of the North Pacific ocean, the same judicious author observes, that this part of it is contracted in latitude 66° to the narrow space of 40 miles; and in latitude 52° , it occupies the space of only 30° in breadth from east to west, that is, about 1300 miles: whereas the Atlantic in latitude 52° is about 1700 miles in breadth, and is no where contracted to a less space than 700 miles. To which we may add, that the coasts of Asia on one side, and those of America on the other, are bordered with high mountains, covered with snow for a great part of the year; and numerous high islands lie scattered between both continents. From these circumstances we have sufficient reason for concluding *à priori*, that this sea should be much colder than that portion of the Atlantic contained between the same parallels: for, during the winter, the mountains that line the coasts are cooled to a much greater degree than the flat

coasts of the Atlantic; and the sea, where it is narrow, is entirely frozen: in summer, heaps of ice, being long sheltered from the sun by the islands, are carried down into lower latitudes, and the snow remains long unmelted on the mountains; so that Mr. Kirwan is inclined to think, that the annual temperature of it is at least 4 degrees below that of the standard in corresponding latitudes. But further observations are necessary for determining with precision the mean temperature of any of these parts. But it is not in the sterility of the ground alone that the Kamtschadales feel the unfavourable temperature of their climate; the uncertainty of the summer season sometimes prevents their laying up a sufficient stock of dried fish for their winter's provision, and the moisture of the air causes worms to breed in them, which not unfrequently destroy the greatest part. The inhabitants of this country are very seldom troubled with storms of thunder and lightning; and never but in a slight degree. The general severity of the winter, as well as the dreadful hurricanes of wind and snow which that season brings along with it, cannot be questioned, from the subterraneous habitations to which the natives are under a necessity of resorting for warmth and security. Major Behm informed captain King and his companions, that the cold and inclemency of the winter of 1779 were such, that, for several weeks, all intercourse between the inhabitants was entirely obstructed, every one being afraid to stir even from one house to another, for fear of being frost-bitten. This extraordinary rigour of climate in so low a latitude may be accounted for, from its being situated to the east of an immense uncultivated tract of country, and from the prevalence of the westerly winds, blowing over so extensive and cold a continent. The extraordinary violence and impetuosity of the winds are attributed to the subterraneous fires, the sulphureous exhalations, and the general volcanic disposition of the country. This peninsula abounds in volcanos, of which only three have been, for some time past, subject to eruptions. One of these is situated in the neighbourhood of Awatska. The volcano of Tolbatchick is situated on a neck of land between the river of Kamtschatka and Tolbatchick. The mountain, from the summit of which the eruptions proceed, is of a considerable height, and terminates in pointed rocks. The third volcano is on the top of the mountain of Kamtschatka, which is mentioned as the highest in the peninsula. A thick smoke never ceases to ascend from its summit, and it has frequent eruptions of the most violent and dreadful kind; some of which were much talked of when captain King visited the island, and seemed to be fresh in the memories of the Kamtschadales. This country contains numerous springs of hot water, and extraordinary pits or wells, at the bottom of which the water seems to boil as in a cauldron with prodigious impetuosity, accompanied with a dreadful noise, and discharging a thick vapour.

Near the village Milkova a merchant of Irkutsk, in 1760, discovered iron ore, and erected smelting houses on the spot. Silver ore, though not very rich, is also said to have been found in Kamtschatka. Of the trees which fell under the notice of captain King and his associates, the principal were the birch, the poplar, the alder, (with the bark of which they stain their leather,) many species of the willow, and two sorts of dwarfish pines or cedars, of one of which they made their essence for beer, and it was found excellent for the purpose. The birch tree was the most common; and of this there were three sorts, two of which are fit for timber, and the third, which is of a dwarfish kind, is applied to a variety of uses. The liquor, yielded by it upon being tapped, is drank without any previous preparation; the bark is converted into vessels for domestic purposes; and of

the wood they make their sledges and canoes. Besides the trees above mentioned, there are the larch, and also firs, the service-tree, and two species of the white-thorn. Of the shrub kind, as junipers, the mountain-ash, rose-trees, and raspberry bushes, the country produces great abundance; together with a variety of berries, which are collected at the proper season, and preserved by boiling them into a thick jam, without sugar. These are used as sauce to their dried and salt fish; and are eaten by themselves, in puddings, and various other ways; and decoctions are also made of them for their ordinary liquor. The country furnishes many wholesome vegetables in a wild state, such as wild celery, angelica, chervil, garlic, and onions; and upon some spots of ground in the valleys there are excellent turnips and turnip-radishes. They have also more recently cultivated potatoes. Major Behn exerted himself very laudably in endeavouring to promote agriculture and grazing, and not altogether without effect; and his successor, Mr. Assessor Reinikin, continued these endeavours, inasmuch that, in 1782, from 68½ pood of winter-rye 3416 sheaves, and from 59½ pood of barley 24,840 sheaves, were reaped. Oats, wheat, and buck-wheat, were much injured by the early frosts; but hemp succeeds very well. There are two plants in this country that deserve particular notice, on account of the extensive use to which they are applied: one, called by the natives "Sarana," is the *Lilium Kamtschatense flore atro rubente*, of which Steller enumerates five different species. The roots are collected in the beginning of August, dried in the sun, and laid up for use. When roasted in embers, it supplies the place of bread; and baked in the oven and pounded, it becomes an excellent substitute for flour and meal of every sort, and in this state is mixed in all their soups, and most of their other dishes. It is esteemed very nourishing. The roots of this plant are also applied to similar purposes at Oonalashka. The other plant is called the "Sweet grass," the *Heracleum Sibericum foliis pinnatis*, &c. Hort. Upsal. 65. This plant was formerly a principal ingredient in the cookery of most of the Kamtschadales; but since the Russians have obtained possession of the country, it is entirely appropriated to the purposes of distillation. The liquor obtained from it is of the strength of brandy, and is called by the natives "raka." Two pood (72 pounds) of the plant yield generally one vedro (25 pints) of raka. There are several other plants, which we cannot enumerate. It is said, that the Kamtschadales (before their acquaintance with fire-arms) poisoned their spears and arrows with the juice of the root of the "zgate" (*anemonoides et ranunculus*); and that wounds inflicted by them are equally destructive to land and marine animals. The Tschutschi are reported to use the same drug for this purpose at present. Of the straw of the "*triticum radice perenni spiculis binis lanuginosis*," which grows abundantly along the coast, they make a strong matting, which they use not only for their floors, but for sacks, bed-clothes, curtains, and a variety of other domestic purposes. Of the plant called "*bolotnaia*," growing in the marshes, and resembling *cyperoides*, which is carded like wool, with a comb made of the bones of the sea-swallow, they make various garments, which they use instead of linen and woollen cloths. The nettle supplies the place of hemp and flax, and serves in the manufacture of their fishing-nets.

The animals of this peninsula are the common fox, the stoat or ermine, the zibelline or sable, the isatis or arctic fox, the varying hare, the mountain rat or earless marinet, the weasel, the glutton or wolverene, the argali or wild sheep, rein-deer, bears, wolves, and dogs. The dogs are very numerous; and they are very useful in drawing the sledges,

which are the common vehicles of the country. The coast and bays of this country are frequented by almost every sort of northern sea-fowl; the rivers are stored with numerous flocks of wild ducks of various species. In the woods are eagles of a very large size; and of the hawk, falcon, and bultard kind, there are great numbers. This country likewise affords wood-cocks, snipes, and two sorts of grouse, or moor-grouse. Swans are also very plentiful, and generally, in their entertainments, make a part of their repast. The sea-coast furnishes no amphibious animals, except seals, which swarm in the bay of Awatska, where they pursue the salmon, that are collected there in shoals in order to ascend the rivers. They are also found in most of the lakes, which communicate with the sea. The sea otters resemble those of Nootka sound; but since the Russians have opened a trade for their skins to China, where they are sold at a price above that of any other kind of fur, they have been hunted almost entirely out of the country. Those of the Kurile islands are of a superior quality to those of Kamtschatka, or the American coast. Fish may be considered as the staple article of food, with which providence hath supplied the inhabitants of this peninsula. Whales are frequently seen, both in the sea of Ochotsk, and on the side of the eastern ocean, and when caught, are converted to various uses. Of the skin they make the soles of their shoes, and straps and thongs for various other purposes. The flesh they eat, and the fat is stored up, both for kitchen use and for their lamps. The whippers are used for sewing together the seams of their canoes, and for making nets; and with the under jaw-bones their sledges are shod. They work the bones into knives; the intestines are cleaned, and blown like bladders, for containing their oil and grease; and of the nerves and veins, they make excellent snares. Flat-fish, trout, and herrings are abundant; the season for the latter begins in May, and they do not remain long on the coast; they are fine and large. They have also cod of a large size; but their principal dependence is on salmon, which they lay up in store for their winter provisions. The season of fishing, for this species, lasts from the middle of May till the end of June.

The present inhabitants of Kamtschatka are of three sorts; the natives, or Kamtschadales; the Russians and Cossacks; and a mixture of those two by marriage. The true Kamtschadales, are, according to Steller, a people of very great antiquity, and have for many ages inhabited this peninsula; and he says, that they are originally descended from the Mungalians, and not either from the Tungusian Tartars, as some, or the Japanese, as others have imagined. Many words, he says, in their language have terminations similar to those of the Mungalian Chinese, and the same principle of inflexion or derivation obtains in both languages. They are, in general, under-sized, as are the Mungalians; their complexion, like theirs, is swarthy; they have black hair, little beard, the face broad, the nose short and flat, the eyes small and sunk, the eye-brows thin, the belly pendant, the legs small; all which are peculiarities that are to be found among the Mungalians. As the result of the whole he infers, that they fled for safety to this peninsula, from the rapid advances of the eastern conquerors; as the Laplanders, Samoieds, &c. were compelled to retreat to the extremities of the north by the Europeans. The Russians, having extended their conquests, and established ports and colonies along that immense extent of coast of the Frozen sea, from the Jensei to the Anadyr, appointed commissaries for the purpose of exploring and subjecting the countries still farther eastward. They soon became acquainted with the wandering Koriaks inhabiting the N. and N.E. coast of the sea of Ochotsk, and without difficulty

made them tributary. These being the immediate neighbours of the Kamtschadales, and likewise in the habit of bartering with them, a knowledge of Kamtschatka followed of course. The honour of the first discovery is ascribed to Feodot Alexeieff, a merchant, who is said to have sailed from the river Kovyma, round the peninsula of the Tschutski, in company with seven other vessels, about the year 1648. Being separated from the rest by a storm, near the Tschukotskoi-nofs, he was driven upon the coast of Kamtschatka, where he wintered; and in the summer following coasted round the promontory of Lopatka, into the sea of Ochotsk, and entered the mouth of the Tigil; but he and his companions were cut off by the Koriaks, in endeavouring to pass by land from thence to the Anadirsk. But as these discoverers did not live to report what they had done, Volodimir Atlassoff, a Cossack, is reputed the first discoverer of Kamtschatka. This person, under the quality of commissary, penetrated, in 1699, with about 60 Russian soldiers, and the same number of Cossacks, into the heart of the peninsula, gained the Tigil, and levying a tribute of furs, proceeded to cross over to the river Kamtschatka, on which he built the higher Kamtschatka Ostrog, called Verchnei, where he left a garrison of Cossacks, and returned to Jakutsk in 1700, with an immense quantity of rare and valuable tributary furs. Upon his arrival at Moscow, he was appointed commander of the fort of Jakutsk, with farther orders to repair again to Kamtschatka. But as he advanced towards the Anadirsk, he fell in with a bark on the river Tunguska, laden with Chinese merchandize, which he pilaged; but in consequence of a remonstrance from the fullerers to the Russian court, he was seized at Jakutsk, and thrown into prison. During the disgrace and trial of Atlassoff, several successive commissaries were sent into Kamtschatka; but at length Atlassoff was reinstated in his command, and appointed to conduct a second expedition into Kamtschatka; however, in this service he was guilty of oppression and cruelty, which occasioned a mutiny among the Cossacks, and they succeeded in getting him displaced, and seized upon his effects. Accustomed to plunder, they were reduced to military discipline and subjection with great difficulty. The history of this country, from that period till the grand revolt of the Kamtschadales in 1731, presents one unvaried detail of massacres, revolts, and savage sanguinary rencounters between small parties, from one end of the peninsula to another. When peace was established, the country remained tranquil till the year 1740, when a few Russians lost their lives in a tumult; and except an insurrection which occurred at Bolcheretsk in 1770, there has been no disturbance since.

After the rebellion of 1731 was quelled, the country recovered itself, and became more populous than ever; when, in the year 1767, the small-pox, brought by a soldier from Ochotsk, threatened the total extirpation of its inhabitants. It has been computed that near 20,000 died of this disorder in Kamtschatka, the Koreki country, and the Kurile islands. The inhabitants of whole villages were swept away, and their habitations left desolate. In the diminished state of the natives, with fresh supplies of Russians and Cossacks perpetually pouring into the country, and intermixing with them by marriage, it is probable, that in less than half a century there will be very few of them left. According to major Behm's account, there were not, in 1779, more than 3000 who paid tribute, the Kurile islanders included. Capt. King understood that in the year above-mentioned, there were in the five forts of Nichnei, Verchnei, Tigil, Bolcheretsk, and St. Peter and St. Paul, about 400 Russians and Cossacks, and near the same number at Iugiga, which,

though to the N. of the peninsula, was then under the command of Kamtschatka; to these may be added the Russian traders and emigrants, whose number is not very considerable.

The Russian government, established over this country, though military, is in a high degree mild and equitable. The natives are permitted to choose their own magistrates among themselves, in the way and with the same powers to which they had ever been accustomed. One of these, under the title of "Toion," presides over each "ostrog," who refers merely cases of difficulty, or crimes of peculiar malignity, to the decision of the governor of Kamtschatka. The Toion has likewise the appointment of a civil officer, called a corporal, who assists him in the execution of his office, and in his absence acts as his deputy. By an edict of the late empress, no crime whatever can be punished with death; but it is said, that, in cases of murder, the punishment of the "knout" is administered with such severity, that the offender generally dies under it. The only tribute exacted, as an acknowledgment of the Russian dominion, consists, in some districts, of a fox's skin, in others of a sable's, and in the Kurile isles of a sea-otter's. The tributes are collected by the Toions in their several districts. The Russians, it is said, have taken great pains in converting the Kamtschadales to Christianity, and they have so far succeeded, that there remain few idolaters among them. The religion taught and professed is, of course, that of the Greek church. Schools are likewise established in many of the ostrogs, where the children of both the natives and the Cossacks are gratuitously instructed in the Russian language.

The commerce of this country, as far as concerns the exports, is entirely confined to furs, and carried on principally by a company of merchants, instituted by the late empress. Besides these, there are many inferior traders (particularly of the Cossacks) scattered through the country. The principal merchants, during their stay in the country, reside at Bolcheretsk, or the Nishnei ostrog, in which two places the trade almost wholly centres. The articles of importation are principally European, but not restricted to Russian manufactures; many are English and Dutch; several likewise come from Siberia, Bucharia, the Kalmucks, and China. They consist of coarse woollen and linen clothes, yarn stockings, bonnets, and gloves; thin Persian silks; cottons, and pieces of nankeen, silk and cotton handkerchiefs; brass coppers and pans, iron stoves, files, guns, powder, and shot; hardware, such as hatchets, bills, knives, scissors, needles, looking-glasses; flour, sugar; tanned hides, boots, &c. It has been observed, that these articles in general are sold for treble the price they might have been purchased for in England; and though the merchants have so large a profit upon these imported goods, they have a still larger upon the furs at Kiachta, upon the frontiers of China, which is the great market for them. The best sea-otter skins sell generally in Kamtschatka for about 30 roubles a-piece; at Kiachta the Chinese merchant buys them at double that price, and sells them again at Peking at a considerable advance, where a profitable trade is made with some of them to Japan. All furs exported from Kamtschatka across the sea of Ochotsk, pay a duty of 10 per cent. and sables a duty of 12; and all sorts of merchandize imported from Ochotsk pay half a rouble for every pood (36 pounds English). The duty on exports and imports is paid at Ochotsk; and the tribute, which amounted, in 1779, to 10,000 roubles annually, is collected at Bolcheretsk. Six vessels, from 40 to 50 tons burthen, were employed by the late empress between Ochotsk and Bolcheretsk; five for the transportation of stores and provisions from the former to the latter place, and one

as a packet boat for conveying dispatches. Besides these, there are about 14 vessels employed by the merchants in the fur trade, among the islands to the eastward. The most considerable and valuable part of the fur trade is carried on with the islands that lie between Kamtschatka and America.

The houses in Kamtschatka are of three sorts, viz. *jourts*, *balagans*, and *log-houses*, called there *ibas*. The first are their winter, and the second their summer habitations; the third are altogether of Russian introduction, and inhabited only by the better and wealthier sort. A town of Kamtschatka is called an "ostrog," and consists of several of the three sorts of houses above-mentioned; but the balagans are the most numerous. St. Peter and St. Paul consists of seven log-houses, 19 balagans, and three jourts. Paratounca is of about the same size. Karatchin and Natchekin contain fewer log-houses, but full as many jourts and balagans as the former. The outermost garment of the men is of the shape of a carter's frock. Those worn in summer are of nankeen; in winter they are made of skins, most commonly of the deer or dog, tanned on one side, the hair being left on the other, which is worn innermost. Under this is a close jacket of nankeen, or other cotton stuff; and beneath that a shirt of thin Persian silk, of a blue, red, or yellow colour. The remaining part of their dress consists of a pair of tight trowsers, or long breeches, of leather, reaching down to the calf of the leg; of a pair of dog or deer-skin boots, with the hair innermost; and of a fur cap, with two flaps, which are generally tied up close to the head, but in bad weather are let to fall round the shoulders. On ceremonious occasions the Toions wear a fur dress. The dress of the women consists of a full loose robe of white nankeen, gathered close round the neck, and fastened with a collar of coloured silk. Over this they wear a short jacket without sleeves, made of differently coloured nankeens, and petticoats of a slight Chinese silk. Their shifts, which have sleeves down to the wrists, are also of silk; and coloured silk handkerchiefs are bound round their heads, concealing entirely the hair of the married women, whilst those who are unmarried, bring the handkerchief under the hair, and suffer it to flow loose behind.

The Kamtschadales amuse themselves with singing and dancing. Their dancing they seem to have learned from the bears, which is intended to represent the awkward and clumsy gestures of this animal. The body was always bowed and the hams bent, whilst the arms were used in imitating the tricks and attitudes of that animal. Cook's Third Voyage, vol. iii. Took's Russian Empire, vol. i. Cox's Russian Discoveries.

KAMTSCHATKOI Noss, the southern cape of Kamtschatka. N. lat. 55° 3'. E. long. 163° 20'.

KAMTSCHATSKOI, *Niznei* or *Lower*, a town or ostrog of Russia, on the E. side of the peninsula of Kamtschatka, about 20 miles from the river Kamtschatka; containing two churches and about 150 houses, and having a citadel with magazines, an arsenal, guard-house, and barracks. It is the seat of two tribunals, one for matters of government, and another for those of commerce; 142 miles E.S.E. of Ochotsk. N. lat. 56° 40'. E. long. 160° 14'.

KAMTSCHATKOI, *Verchnei* or *Upper*, a town or ostrog of Russia, in the peninsula of Kamtschatka, governed by a serjeant, and containing about 600 houses; 60 miles N.N.E. of Bolcheretskoi. N. lat. 93° 50'. E. long. 157° 39'.

KAN, a river of Russia, which runs into the Enisei, near Balchutsko, in the government of Kolivan.—Also, a river of China, which rises in the S. part of Kiang-si, and runs into the lake Po-yang; 20 miles N. of Tchang.

KAN, or *Khan*. See KHAN.

KANA, in *Geography*, a town of Arabia, in the province of Hedsjaz; 40 miles E.S.E. of Hajar.

KANAAP, a town of Hindoostan, in Bahar; 47 miles S.S.W. of Patna.

KANADEI, a town of Russia, in the government of Simbirsk; 72 miles S.S.W. of Simbirsk.

KANAGA, one of the Andreanofskie islands, between Kamtschatka and America, which has a high smoking mountain.

KANAHOOBY, a town of Persia, in the province of Colestan; 100 miles W.S.W. of Nisabur.

KANAKI, a small island in the gulf of Engia, near the W. coast of Coluri.

KANAMBADDY, a town of Hindoostan, in Mysore; 8 miles W. of Srirangapatam.

KANAN, a town of Africa, in the kingdom of Cayor, near the Atlantic. N. lat. 16° 40'. W. long. 15° 55'.

KANANIKOLSKOI, a town of Russia, in the government of Upha; 52 miles S.W. of Sterlitamatzk.

KANAR, a large lake, formed by an expansion of the river Dewah, in the country of Kemaoon.

KAN-AREDMERD, a town of Persia, in Faristan; 90 miles S. of Schiras.

KANARNA, a town of European Turkey, in Bulgaria; 22 miles N.E. of Varna.

KANARY, a small island in the East Indian sea, surrounded by a number of islets, called by this name. S. lat. 1° 44'. E. long. 129° 54'.

KANAS, or KANGAS, a town of Turkish Armenia; 60 miles S.E. of Erzerum.

KANASTER, is a name given in America to baskets of rushes or cane, in which they put the tobacco which they send into Europe: hence arises the name of kanaster tobacco, the best of which comes from Makaribou.

KANAZAVA, in *Geography*, a town of Japan, in the island of Nippon; 130 miles N.E. of Meaco.

KANCABA, a town of Africa, in the kingdom of Mandingo, seated on the Niger, a mart for slaves; 16 miles S.E. of Kamalia.

KANDA, a town of Africa, in the kingdom of Congo; 30 miles N.E. of St. Salvador.—Also, a town of Japan, in the island of Xicoco; 16 miles S.E. of Ovutshi.

KANDABAGA, mountains that form part of the boundary between Russia and Chinese Tartary, a part of the great chain W. of the river Oka. See SAYANE Mountains.

KANDABIL, a town of Persia in the province of Meeran, 28½ miles S. of Candahar. N. lat. 28° 28'. E. long. 67° 20'.

KANDAL, a town on the N. coast of the island of Java. S. lat. 6° 48'. E. long. 110° 18'.—Also, a town of Abyssinia, near the coast of the Red sea. S. lat. 14° 30'. E. long. 41° 15'.

KANDALAKS, a town of Russia, in the government of Archangel, on the N. coast of the White sea; 140 miles S.S.E. of Kola.

KANDARPA, a name of Kama, the Hindoo god of love. See KAMA.

KANDEGHERI, in *Geography*, a town of Hindoostan, in the Carnatic, formerly the capital of a kingdom, called Narlinga, and the residence of a Hindoo king, whose dominions extended over Tanjore and Madura. In 1640, a descendant of the reigning prince permitted the English to form a settlement at Madras. It is distant 70 miles N.W. from Madras. N. lat. 13° 46'. E. long. 79° 24'.

KANDEH-RAO, or KANDOBA, in *Hindoo Mythology*,

an avatara or incarnation of Siva; his consort, Parvati, having been also incarnated, under the name of Malfara, to accompany her lord in this manifestation, which is said by some to have occurred in the Carnatic, for the purpose of destroying a giant named Manimal. A magnificent temple is dedicated to the worship of Siva, in this incarnation, at Jejury. It is described under that article; and by some it is said, the incarnation happened there. The incarnated pair are generally represented together on horseback, with a dog, he being four armed. Images and pictures of them are very common in the Mahratta country, where Kande-Rao is a popular deity, and is very extensively propitiated. Several engravings of the subject of this article are given in Moor's Hindoo Pantheon.

KANDEK, in *Geography*, a town of Asiatic Turkey, in the province of Natolia; 48 miles E. of Ismid.

KANDEL, in *Botany*. See RHIZOPHORA.

KANDERI, in *Geography*, a town of Asiatic Turkey, in Natolia; 24 miles N.E. of Ismid.

KANEKING, a town of the Arabian Irak; 23 miles N.N.E. of Shehrban.

KANEM, a city of Africa, in the way from Fezzan to the capital of Bornou. The inhabitants of the adjacent country are composed of Mussulmen and Pagans, and are employed in breeding cattle, and raising innumerable horses for the service of the king; 125 miles N. of Bornou. N. lat. 32° . E. long. $21^{\circ} 40'$.—Also, the name given by the geographer Edrisi to the kingdom of *Bornou*; which see.

KANG, or *Chinese Stove*, is a kind of stove that is heated by means of a furnace, which casts all its heat into it. The furnace is adapted to the fire of the stove which it is intended to heat; and it may be placed either in a room that is used, or an adjoining room, or on the outside of the house. The heat of this furnace, impelled by the outward air, rushes through a slit into a tube or conductor; and passing through this into another pipe or channel at right angles to it, lying under the middle of the floor of the stove, spreads through the stove by vent-holes in this last pipe, and is communicated to the bricks which form the pavement of the stove, and from them through the whole room. The smoke is carried off by funnels at both ends of the stoves. See a drawing and description of this kind of stove in Phil. Trans. vol. lxi. p. i. art. 7.

Any kind of fuel is used in the heating furnaces, but sea-coal is generally used: it is observed, that in order to draw off the noisome vapours of the air constantly heated by the coal fire, the Chinese always keep bowls of water in the rooms, and occasionally renew them; and the emperor's apartments in the palace are decorated with flower-pots, and little orange-trees, &c. which, as the Chinese philosophers allege, is the best way of sweetening the air, and absorbing the fiery particles dispersed in it.

KANGA, in *Geography*, a sea-port of Africa, in the kingdom of Loango, situated in a sandy bay of the Atlantic, where vessels may ride at anchor within musket-shot of the shore, in four or five fathoms water.

KANGAANPAA, a town of Sweden, in the government of Abo; 27 miles N.E. of Biorneborg.

KANGAN, a town of Hindoostan, in Mysore; 25 miles W. of Tadmeri.

KANGASAK, a town of West Greenland. N. lat. 62° . W. long. 48° .

KANGASALA, a town of Sweden, in the province of Tavastland; 30 miles N.N.W. of Tavasthus.

KANGASNIEMS, a town of Sweden, in the province of Tavastland; 85 miles N.E. of Tavasthus.

KANG-CHAN, a town of Corea; 16 miles S.W. of Kang-tcheou.

KANGEE, a town of Africa, in the kingdom of Kaffon; 33 miles S.E. of Kooniakary.

KANGELANG, an island in the East Indian sea, about 25 miles from east to west, indented on the south coast with two or three considerable bays. S. lat. $6^{\circ} 37'$. E. long. $115^{\circ} 44'$.

KANGIS, a town of Sweden, in West Bothnia; 80 miles N. of Tornea.

KANG-TCHEOU, a town of Corea, in Kinchan; 170 miles S.E. of Peking. N. lat. $35^{\circ} 46'$. E. long. $128^{\circ} 49'$.

KANG-TCHEOU, a city of China, of the first rank, in the province of Kiang-fi; situated on a river of the same name. Its river, port, riches, and population, serve to attract strangers. Near the walls of the city is a very long bridge, composed of 130 boats, joined together by strong iron chains. The custom-house is upon this bridge, where a receiver constantly resides, to visit all barks, and examine if they have paid the necessary duties. Two or three moveable boats are so placed, that by their means the bridge can be opened or shut, to give or stop a passage; and no barks are suffered to pass that have not been examined. In the territory belonging to this city, a great number of those valuable trees grow, from which varnish distils. Its district is extensive, and contains twelve cities of the third class. N. lat. $25^{\circ} 32'$. E. long. $114^{\circ} 30'$.

KANG-TCHIN, a town of Corea; 48 miles S.S.W. of Koang-tcheou.

KANGUROO, in *Zoology*, an animal on the coast of New Holland, which, when full grown, is as big as a sheep; and in form resembling the jerboa. The head, neck, and shoulder, are very small in proportion to the other parts of the body; the tail is nearly as long as the body, thick near the rump, and tapering towards the end: the fore-legs of one of them measured only eight inches in length, and the hind-legs twenty-two: the progress is by successive leaps or hops of a great length, in an erect posture: the fore-legs are kept bent close to the breast, and seem to be of use only for digging. The skin is covered with a short fur, of a dark mouse or grey colour, excepting the head and ears, which bear a slight resemblance to those of a hare. Hawkesworth's Voyages, &c. vol. iii. p. 174.

KANHAWA, in *Geography*, a large mountainous county of America, on the western line of Virginia, having the Ohio river on the north-west, and Kentucky on the west. The population consists of 3008 free inhabitants, and 231 slaves. About seven miles from the mouth of Elk river, in this county, is a burning spring, sufficiently capacious to hold forty gallons. A bituminous vapour constantly issues from it; and on presenting a torch within eighteen or twenty inches of its mouth, a column of flame ascends to the height of three or four feet, and about eighteen inches in diameter, which burns sometimes for ten minutes, and at other times continues three days.

KANHAWAY, GREAT, a river of Virginia, the head-waters of which are in the western part of North Carolina, in the most easterly ridge of the Alleghany or Appalachian mountains, and south of the thirty-sixth degree of latitude. These head branches encircle those of the Holston, from which they are separated by the iron mountain, through which it passes ten miles above the lead-mines. About sixty miles from Little river it receives Green Briar river. About forty miles below the mouth of Green Briar river in Virginia, in the Kanaway, is a remarkable cataract,

the water falling over a rock that traverses the bed of the river about fifty feet perpendicularly. The obstacles to the navigation of this river are the Great Falls, ninety miles above its mouth; and from these falls to the mouth of Green Briar is a distance of 100 miles. Its mouth, where it falls into the Ohio, in the north-west part of Virginia, (N. lat. $38^{\circ} 55'$. W. long. $82^{\circ} 15'$) is 280 yards wide.

KANAWAY, *Little*, a small navigable river of Virginia, 150 yards wide at its mouth in the Ohio, (N. lat. $39^{\circ} 6'$. W. long. $81^{\circ} 53'$) and navigable only ten miles.

KANJA, YANSIA, or *Tanja*, a town of Persian Armenia, on a small river which runs into the Kur; 150 miles E.N.E. of Erivan.

KANJEE, a town of Hindoostan, in Berar; 20 miles N. of Nohagong.

KANIKA, a town of Africa, in the kingdom of Bambarra, seated on the Niger; 100 miles S.W. of Sego.

KANOW, a town of Russian Poland, in the palatinate of Kiev, on the Dnieper; 56 miles E. of Bielacerkiew.

KANISS, a town of Africa, in Nubia, on the west side of the Nile; 25 miles E. of Dongala.

KANITZ, a town of Moravia, in the circle of Brunn; 10 miles S.W. of Brunn. N. lat. $49^{\circ} 4'$. E. long. $16^{\circ} 21'$.

KANKANAN, a town of Hindoostan, in Lahore; 12 miles S.E. of Lahore.

KANKARU, a town of Africa, in Mandingo. N. lat. $12^{\circ} 20'$. W. long. $5^{\circ} 45'$.

KANKERARA, a town of Hindoostan, in the circle of Kottah; 32 miles W. of Kottah.

KANKY-LABY, a town of Africa, in the country of Foota. N. lat. $10^{\circ} 55'$. W. long. $16^{\circ} 5'$.

KANNAKA, a town of Hindoostan, in the country of Kattack, at the mouth of the river Bramnee; 15 miles N.W. of Point Palmiras.

KANNCOONGAN POINT, a cape on the east coast of Borneo. N. lat. $1^{\circ} 3'$. E. long. 119° .

KANNEAH, a town of Hindoostan, in the circle of Sumbul; 15 miles N. of Nidjebabad.

KANNYA, a town of Hindoostan, in Rohilcund; 35 miles S. of Bereilly.

KANOOERAH, a town of Hindoostan, in Goondwanah; 75 miles N.N.E. of Nagpour.

KANOON, a town and fortress of Hindoostan, in the country of Mewat; 70 miles S.W. of Delhi. N. lat. $28^{\circ} 3'$. E. long. $76^{\circ} 30'$.

KANOUNG, *LITTLE*, or KANOUNGLEY, a town of the Birman empire, on the Irrawaddy, in the vicinity of which are plantations of various fruit trees, and fields well fenced and regularly laid down; with every aspect of industry and plenty.

KANOUNG, *Great*, or *Kanounghe*, a long town, situated like the preceding, with a good quay, and well constructed wooden stairs, consisting of 100 steps, descending to the water's edge. The population in the neighbourhood of this and the forementioned town is considerable.

KANOWLY, a town of Hindoostan, in the country of Vissapour; 22 miles E.S.E. of Poonah.

KANSA, in *Hindoo History*, the uncle of Krishna, whom, as his predestined destroyer, Kansa made many vain attempts to put to death. After several fruitless efforts, Kansa ordered all male infants to be slain; in a manner that reminds us of the cruelty of Herod on a similar occasion. See KRISHNA.

KANSAKI, in *Geography*, a town of Japan, in the island of Niphon; 28 miles S.W. of Meaco.—Also, a

town of Japan, in the island of Ximo; 15 miles S.W. of Ikna.

KANSEZ, a river of Louisiana, which runs into the Missouri, N. lat. $38^{\circ} 45'$. W. long. $95^{\circ} 35'$.

KANSEZ, *Little*, a river of Louisiana, which runs into the Missouri, N. lat. $38^{\circ} 17'$. W. long. $94^{\circ} 53'$.

KANSEZ, a town of Louisiana, seated on the river Kansez; 240 miles W. of Genevieve. N. lat. $38^{\circ} 5'$. W. long. $95^{\circ} 54'$.

KANSKOI, a town of Russia, in the government of Kolivan, on the Kan, in which is carried on a considerable trade in furs; 140 miles E. of Kraf-noiarfk.

KANSON, an island in the Red sea, about twenty miles long, and from two to five broad. N. lat. $16^{\circ} 44'$. E. long. $42^{\circ} 40'$.

KANSZILI, a town of European Turkey, in Bessarabia; 28 miles S. of Bender.

KANT, in *Biography*. See KANTISM.

KANTAMATI, a name of Radha, the wife or mistress of Krishna. See RADHA.

KANTERA, EL, in *Geography*, a town of Africa, in the kingdom of Tunis; 14 miles N. of Tunis.

KANTISM, or philosophy of Emanuel Kant, in the *History of Literature*, is the denomination of a system of metaphysical science, invented and propagated with great avidity on the continent, towards the close of the eighteenth century. It is now, even in its birth-place, much neglected; and will probably, in another half century, fall into utter oblivion. The celebrity, however, to which it attained, requires that a pretty full account should be given of it, in a work devoted to the illustration of the principles espoused and vindicated by men endowed with superior talents and ardent tempers. We shall, accordingly, first give a biographical sketch of the philosopher, and then endeavour to unravel and develop the secrets of his system.

Emanuel Kant was born April 22d, 1724, in the suburbs of Konigsberg, in Prussia. His father, John George Kant, was a saddler, born at Memel, but originally descended from a Scotch family, who spelt their name with a C; but the philosopher, the subject of this article, in early life, converted the C into a K, as being more conformable to German orthography. Emanuel, the second of six children, was indebted to his father for an example of the strictest integrity, and the greatest industry; but he had neither time nor talent to be his instructor. From his mother, a woman of sound sense and ardent piety, he imbibed sentiments of warm and animated devotion, which left, to the latest periods of his life, the strongest and most reverential impressions of her memory on his mind. He received his first instructions in reading and writing at the charity school in his parish; but soon gave such indications of ability and inclination to learn, as induced his uncle, a wealthy shoe-maker, to defray the expence of his farther education and studies. From school he proceeded to the college of Fridericianum. This was in the year 1740; and his first teacher was Martin Kautzen, to whom Kant was strongly attached, and who devoted himself with no less zeal to the instruction of his pupil, and contributed very greatly to the unfolding of his talents. His favourite study at the university was that of mathematics, and the branches of natural philosophy connected with them. On the completion of his studies, he accepted a situation as tutor in a clergyman's family. In this, and in two other similar situations, he was not able to satisfy his mind that he did his duty so well as he ought: he was, according to his own account, too much occupied with acquiring knowledge to be able to communicate the rudiments

ments of it to others. "I always," said he, "valued the business of instructing of young people; but I could never level myself to their infant capacities." Having acted in the capacity of a tutor for nine years, he returned to Königsberg, and maintained himself by private instruction, that he might be ready to embrace the first opportunity that offered of being introduced to a higher sphere of action in the university. In 1746, at the age of twenty-two, he began his literary career with a small work, intitled, "Thoughts on the Estimation of the Animal Powers, with Strictures on the Proofs advanced by Leibnitz and other Mathematicians on this Point; to which are annexed, various Reflections on the Powers of Bodies in general." In 1754, he published "An Examination of the Prize Question of the Berlin Society,—Whether the Earth, in turning round its Axis, by which the Succession of Day and Night was produced, had undergone any Change since its Origin? What could be the Causes of it; and how we could be assured of it?" This work acquired him great reputation as a philosopher, and paved the way to his long-desired promotion to a degree in the university. In the year 1755, he was chosen master of arts, and entered immediately upon the task of lecturing, which he performed to his own satisfaction, and the enthusiastic approbation of a very crowded audience. During the space of fifteen years, which he continued in this office, he published a variety of tracts on the abstruse branches of science. Among these may be mentioned, 1. "An universal Natural History and Theory of the Heavens, or an Essay on the Constitution and mechanical Structure of the whole Globe, according to the Newtonian System." On this subject his biographer says, "that the justness of Kant's theory was, thirty years afterwards, evinced by the practical investigation of Herschel." 2. "Principiorum primorum Cognitionis Metaphysicæ nova Dilucidatio." 3. In 1758, he gave the world "New Principles of Motion and Rest, and the Results connected with them in the Fundamentals of Natural Philosophy." This work excited very much notice, and was afterwards inserted more at large in his later writings. 4. In 1759, he published "Considerations on Optimism." And, 5. In 1763, "The only possible Grounds for a Demonstration of the Deity." In the last mentioned work, the author wished to shew that without presupposing the independent existence of ourselves, or that of other spirits, something is possible; and on that proof alone rests the grounds by which to demonstrate the existence of a Deity. This piece contributed very much to establish his literary character. The first traces of that metaphysical system, which has given such celebrity to the name of Kant, are to be found in his inaugural dissertation, "De Mundi sensibilis atque intelligibilis Forma et Principiis," which was written in the year 1770, when he was appointed to a professorial chair in the university of Königsberg. He had, previously to this, had offers of preferment, which he declined. His reputation and literary character had been long known to the Prussian monarch, who had made him repeated offers of a professorship in the universities of Jena, Erlangen, Mitau, and Halle; and also to have invested him with the character of privy counsellor. He declined all these honours, from an attachment to his native place. He wished to labour and to be useful on the spot where he had received his physical and mental existence; and it was not till March 1770 that the metaphysical department at Königsberg became vacant, which was immediately bestowed upon him. The situation required his whole attention to metaphysical subjects, and his succeeding publications were almost entirely of this nature. He pursued this study with the most unremitting ardour, and entered

into all the depths of metaphysical subtlety, in order to unfold the rational powers of man, and deduce from thence his moral duties. It was not till the year 1781, that the full development of the principles of his system appeared in his "Review of pure Reason." The German title of this work is "Kritik der reinen Vernunft;" and the system it contains is commonly known under the name of the "Critical Philosophy." This celebrated work, on which we shall shortly enlarge, was nearly six years published before its importance was at all understood; and it is perhaps one of the most striking instances of the reverses of literary fortune, that the bookseller was about to destroy the copies for waste paper, when a sudden demand required and exhausted rapidly three new editions. The doctrine was soon presented, under innumerable forms, by a multitude of commentators; among the earliest and most distinguished of whom were Reihold, the son-in-law of Wieland, and the mathematician Schultz. For a considerable time the system of Kant had, in almost every philosopher of Germany, either an avowed partisan or determined antagonist. In his "Criticism of pure Reason," he maintained that the doctrine of materialism was limited by external objects; and that any pretended perception of things in themselves, and independent of a sensual representation, was utterly impossible. This publication, which subjected him to much misrepresentation, occasioned a second part in 1783, intitled, "Prolegomena for future Metaphysics, which are to be considered as a Science." In this he illustrated his former doctrine, and entirely abstracted from the definition of metaphysics any thing supernatural. In 1786, he was appointed rector of the university, an office to which he was called a second time in 1788; and in a few months after, he was advanced to be senior of the philosophical faculty. About the year 1798, he took leave of the public as an author, and soon after gave up all his official situations; and, in consequence of increasing infirmities, he retired into an almost perfect solitude, having been a writer sixty years, and having written more than sixty works. During the last ten years of his life, his corporeal and mental decay was strikingly and painfully visible to his friends: but in nothing did the decay of nature discover itself so clearly as in his perfect loss of memory. An intimate friend, who had been a beloved scholar also, and who had for many years enjoyed the pleasure of his society, entered his room a few months before his decease, and with the freedom of a friend, going up to him, embraced him with a sort of filial reverence. Kant, however, declared that he had not the pleasure of knowing him. He used every means in his power to bring the idea of himself fresh in his mind; but it was all in vain: "the sun of his genius was set; the vapour which overspread the horizon of his soul, darkened every object past and present." He died on the 12th of February 1804. The character of M. Kant called for universal respect and admiration; and during his life he received from the learned throughout Germany, and from others in distant countries, marks of esteem bordering upon adoration. His principles were made the subject of universal investigation, and obtained him a multitude of zealous adherents. In the universities of Jena, Halle, Göttingen, Erlangen, &c. lectures were delivered on his system; and books were written by his advocates, to illustrate and defend his doctrines. Professors were even sent, at the request and expence of princes and crowned heads, to learn more minutely, by a personal conference with him, what had not been sufficiently elucidated in his books. His lectures were constantly crowded by young persons; and, not unfrequently, persons far advanced in years and knowledge came to sit, as disciples, at

the feet of the German Gamaliel. Truth was the object of his search, and liberality was the result. He wished to establish all human knowledge on the firm basis of reason; and rejected all principles as visionary, which did not admit of a fundamental explication. He conceived, however, of religion as an inherent quality of the soul, which panted after some higher object than this transitory existence. It demanded no proof from without: it flowed of itself from within ourselves. Hence he was accused by some of mysticism, and by others of infidelity: but it seems certain from the testimony of his best friends, and from the whole tenor of his works, that he was a firm believer in the existence of a great First Cause, in a future state of rewards and punishments, and in Christianity. In his political opinions, he held that all men were originally born free; but, though a citizen of the world, he was, at the same time, a friend to peace and good order, and deprecated every violent effort which was made to acquire that freedom to which all men are by nature entitled; and in his own private conduct, he always testified due respect and submission to established authorities. By one of his biographers, M. Charles Villers, Kant is represented as having never withdrawn, in a life of eighty years, from his native city; contenting himself, in the true simplicity of a sage, with the occupations of study, and the society of a few favoured friends. It is not merely as a metaphysician that he claims to be considered; for there is scarcely a science which he has not endeavoured to illustrate. He is a mathematician, an astronomer, a chemist; in natural history, in physics, in physiology, in history, in languages, and literature, and the arts; in all the details of geography, as they relate to the exact situation of the parts of the globe, their inhabitants, and productions, every thing is familiar to him. The prominent feature in Kant's intellectual character was the accuracy with which he analysed the most complex ideas. Nothing escaped the scrutiny of his intellectual eye. Whatever was barely perceivable to others in the moral and physical world, became manifest to him. He discovered, therefore, very easily the congruities of other men's sentiments, and traced with perfect precision their errors to their true source. He had likewise the faculty of unfolding the most abstruse principles, and digesting single and individual sentiments into a systematic order. Herein consisted the originality of his mind. He viewed the world through the medium of his own happy temper, and found every thing around him agreeable and alluring. He is said to have united in the happiest degree two qualities so rarely combined in one person, - the greatest acuteness of reasoning, with the polish of a gentleman. He possessed the enviable talent of making every thing interesting upon which he spoke, and of being able to speak upon every subject. Such was professor Kant. We shall now touch upon his theory as a metaphysician.

Besides employing a vast number of words of his own invention, chiefly derived from the Greek language, Kant uses expressions, which have long been familiar to metaphysicians, in a sense different from that in which they are generally received: and hence a large portion of time is requisite to enable the most sagacious mind to ascertain with precision the import of his phraseology. He divides all our knowledge into that which is "a priori," and that which is "a posteriori." Knowledge "a priori" is conferred upon us by our nature; and knowledge "a posteriori" is derived from our sensations, or from experience; and it is, in this system, denominated "empyric." Kant does not, as this division would seem to imply, intend to revive the doctrine of innate ideas. He considers all knowledge as acquired: he maintains that experience is the productrice of all know-

ledge, and that without it we could not have had a single idea. Our ideas "a priori," he says, are produced *with* experience, but not *by* it, or do not proceed from it. They exist in, and are forms of the mind. They are distinguished from other ideas by two marks, which are easily discerned: they are universal and necessary; they admit of no exception, and their converse is impossible. Ideas which we derive from experience have no such characters. We can imagine that what we have seen, or felt, or heard once, we may see, or feel, or hear again; but we do not perceive any impossibility in its being otherwise. Thus, if I see a building on fire, I am certain of this individual fact; but it affords no general knowledge. But if I take twice two small balls, and learn to call twice two four, I shall immediately be convinced that any two bodies whatever, when added to any other two bodies, will constantly make the sum of bodies four. Experience affords the opportunity of acquiring this knowledge; but it has not given it: for how could experience prove that this truth should never vary? Experience must be limited, and cannot teach what is universal and necessary. It is not experience which discovers to us, that we shall always have the surface of a whole pyramid, by multiplying its base by the third part of its height; or, that two parallel lines extended "in infinitum" shall never meet.

All mathematical truths, according to Kant, are "a priori:" thus, that a straight line is the shortest of all possible lines between two given points; that the three angles in any plane triangle are always equal to two right angles, are propositions which are true "a priori." Pure knowledge "a priori," is that which is without any mixture of experience. Two and two make four, is a truth of which the knowledge is "a priori;" but it is not *pure* knowledge, because the truth is particular. The ideas of substance, and of cause and effect, are "a priori;" and when they are separated from the objects to which they refer, they form, according to this system, "void ideas." It is our knowledge "a priori," that is, the knowledge which precedes experience, as to its origin, which renders experience possible. Our faculty of knowledge has an effect on our ideas of sensation, analogous to that of a vessel which gives its own form to the liquor with which it is filled. Thus, in all knowledge "a posteriori," there is something "a priori," derived from our faculty of knowledge. All the operations of our minds, all the impressions which our senses receive and retain, are brought into effect by the conditions, the forms, which exist in us by the pure ideas "a priori," which alone render all our other knowledge certain. Time and space are the two essential forms of the mind: the first, for impressions received by the internal sense; the second, for those received by our external senses. It is by means of the form *space*, that we are enabled, "a priori," to attribute to external objects impenetrability, divisibility, &c.; and it is by means of the form *time*, that we attribute to any thing duration, succession, &c. Arithmetic is derived from the internal sense, and geometry from that of our external. Our understanding collects the ideas received by the impressions made on our organs of sense, confers on those ideas unity by a particular energy "a priori," and thereby forms the representation of each object. Thus a person is successively struck with the impressions of all the parts which form a particular garden. His understanding unites these impressions, or the ideas resulting from them; and in the unity produced by the act, it acquires the idea of the whole garden. If the objects which produce the impressions, afford also the matter of the ideas, then the ideas are "empyric;" but if the objects only unfold the forms of the thought, the ideas are "a priori."

Judgments are divided into two species; *analytic* and *synthetic*. An *analytic* judgment is that in which the attribute is the mere development of the subject, and is found by the simple analysis of the perception,—as, a triangle has three sides. A *synthetic* judgment is that in which the attribute is connected with the subject by a cause or basis taken from the faculty of knowledge, which renders this connection necessary,—as, iron is heavy; wood is combustible; the three angles of a plane triangle are equal to two right angles.

The forms of the understanding are, in this system, quantity, quality, relation, modality. *Quantity* is distinguished into general, particular, and individual; *quality*, into affirmation, negation, infinite; *relation*, into categoric, hypothetic, and disjunctive; and *modality*, into problematic, certain, and necessary. M. Kant adds likewise to the properties of the four principal forms of the understanding a table of categories, or fundamental ideas, “a priori.”

Pure reason is the faculty of tracing our knowledge “a priori,” to subject it to principles, to trace it from its necessary conditions, till it be entirely without condition, and in complete unity. The great work of Kant is divided into several parts, under the titles, “Of *Æsthetic* transcendental;” “Of transcendental Logic;” “Of the pure Ideas of the Understanding;” “Of the transcendental Judgment;” “Of the Paralogism of pure Reason,” &c. We cannot, from the nature of our work, discuss all the parts of the system; but may observe, that the author contends that we know objects only by the manner in which they affect us; and as the impressions which they make upon us are only certain apparitions or phenomena, it is impossible for us to know what an object is in itself. Hence the system of Kant has been compared with that of Berkeley, which maintains that sensations are only appearances, and that there is no truth, only in our reason. But Kant does not go to this length. According to his theory, the understanding, when it considers the apparitions or phenomena, acknowledges the existence of the objects themselves, inasmuch as they serve for the bases of those apparitions; though we know nothing of their reality, and though we can have no certainty but in experience.

Truth, according to our author, consists in the agreement of our notions with the objects, in such a manner as that all men are obliged to form the same judgment: belief consists in holding a thing to be true, in consequence of a persuasion which is entirely personal, and has not its basis in an object submitted to experience. There is a belief of doctrine; as, that “there are inhabitants in the planets,” which is not the same as moral belief; because in moral belief there is something necessary. The ordinary mode of teaching the existence of God belongs to the belief of doctrine; and it is the same with regard to the immortality of the soul: nevertheless, the author was a firm believer in the existence of God, and a future state; because, said he, “this persuasion renders inmoveable my moral principles,—principles which I cannot reject, without rendering myself contemptible in my own eyes. I wish for happiness, but I do not wish for it without morality; and as it depends on nature, I cannot wish it with this condition, except by believing that nature depends on a Being who causes this connection between morality and happiness. This supposition is founded on the want or necessity of my reason, and not on my duty. We have, however,” says Kant, “no certainty in our knowledge of God; because certainty cannot exist, except when it is founded on an object of experience. The philosopher acknowledges that pure reason is too weak to prove the existence of a being beyond the reach of our senses.

The necessity of believing in God is, therefore, only subjective, although necessary and general for all those beings who conform to their duty. The proofs of natural theology, taken from the order and beauty of the universe, are proofs only in appearance. They resolve themselves into a bias of our reason to suppose an infinite Intelligence, the author of all that is possible; but from this bias it does not follow that there really is such an author. To say, that whatever exists must have a cause, is a maxim “a priori;” but it is a maxim applicable only to experience: for we know not how to subject to the laws of our perceptions that which is absolutely independent of them. It is impossible to know that God exists; but we can comprehend how it is possible to act morally on the supposition of the existence of an intelligent Creator,—an existence which practical reason forces theoretical reason to adopt. This proof not only persuades, but even acts on the conviction, in proportion as the motives of our actions are conformable to the law of morality. Religion ought to be the means of virtue, and not its object. Man has not in himself the idea of religion, as he has that of virtue. The latter has its principle in the mind: it exists in itself, and not as the means of happiness; and it may be taught without the idea of God, for the pure law of morality is “a priori.” He who does good by inclination, does not act morally. There are compassionate minds, which feel an internal pleasure in communicating joy around them, and who thus enjoy the satisfaction of others; but their actions, however just, however good, have no moral merit, and may be compared to other inclinations;—to that of honour, for example, which, while it meets with that which is just and useful, is worthy of praise and encouragement, but not of any high degree of esteem. According to Kant, we ought not even to do good, either for the pleasure which we feel in doing it, or in order to be happy, or to render others happy; for any one of these motives would be *empiric*, and injure the purity of our morals. We ought to act after the maxims derived “a priori,” from the faculty of knowledge, which carry with them the idea of necessity, and are independent of all experience; after the maxims which, it is to be wished, could be erected into *general laws* for all beings endowed with reason.

Such seem to be the leading principles of the philosophy of Kant. It is not our business to enter into a critical examination of them; but the reader will find this very ably done in the first volume of the *Edinburgh Review*, said to have been written by Mr., now sir, James Mackintosh.

Kant, there is no doubt, was very sincere in all the opinions which he maintained. He was a most decided enemy to falsehood of every kind. He never could endure to hear an untruth even in jest; and in his own language, he was scrupulous to avoid every thing that could convey a false idea of himself. Nothing could draw him into a temporary renunciation or qualification of his sentiments; but wherever a free declaration of his opinions was not found agreeable, he was careful never to appear. He wished, in all his actions, to shew himself to the world simply as he was, unvarnished by any false art whatever; and he even condemned the attempt to conceal one's merit under a forbidding appearance. He had a high sense of his own dignity, as an individual in the scale of existence; and he had no less respect for every man, as an independent and thinking being, and evinced these sentiments by a respectful deportment towards all. For merit under every form, and in every person, whether of his own or contrary sentiments, he testified the most unequivocal esteem.

After the death of Mr. Kant, a beautiful medal was executed by M. Abramson of Berlin, as a memorial of his great talents.

talents. On one side is a striking likeness of the philosopher, with the inscription "Immanuel Kant nat. 1724." On the reverse, the artist has attempted to express the services which Kant has rendered to speculative philosophy, by assigning limits to its empire, and to shew, at the same time, the madness of attempting to pass those limits. This he has represented by a Minerva seated, and holding an owl in her right hand, which she prevents from flying, with the inscription, "Altius volentem arcuit." Monthly Magazine, 1805. Edinburgh Review, vol. i. Supp. to Ency. Brit.

KANTO, in *Geography*, a town of Japan, in the island of Nippon; 140 miles W. of Meaco.

KANTOR, a country of Africa, on the south side of the Gambia, with a capital of the same name.

KANTREFF, or KANTREV. See CANTRED.

KANTURK, in *Geography*, a market and post-town of the county of Cork, province of Munster, Ireland, situated on the river Dalia; 125 miles S.W. from Dublin, and 4 miles S.E. from Newmarket.

KANWARRAH, a town of Hindoostan, in the circle of Gurrah; 30 miles S. of Mahur.

KAO, one of the Friendly islands, in the South Pacific ocean, called also Aghao or Oghao, and Kaybay. S. lat. 19 12'. E. long. 184 58'.

KAO-CHAN, a small island in the Chinese sea, and the most westerly of those called Mi-a-tau; 18 miles N.W. of Teng-tseou.

KAOLIN, the name of one of the two substances which are the ingredients of china-ware. The other, which is called *petuntse*, is easily vitrifiable, and this kaolin is scarce at all so: whence the fire composes from a mixture of them both a semi-vitrification, which is china-ware. See PORCELAIN.

The kaolin, used in the composition of porcelain, requires less labour than the *petuntse*. There are large mines of it in the bosoms of certain mountains, the exterior strata of which consist of a kind of red earth. These mines are very deep, and the kaolin is found in small lumps, that are formed into bricks, after having undergone the same process with the *petuntse*; which see. Father d'Entrecolles thinks that the earth called terre de Malte, or St. Paul's earth, has much affinity to the kaolin, although it has not those small shining particles which are interpersed in the latter.

M. Reaumur had an opportunity of examining this substance, not in its native state, but only in form of small bricks, made out of the paste of the powder of the native kaolin and water. He found it of a white colour, and sprinkled all over with fine glittering particles; but these he did not judge to be fragments of a different substance mixed among the mass; as are the small flakes of talc in our clays and sands; but that the whole mass was composed of some stone reduced to powder, and made into a paste with water, and that these larger spangles were only coarser particles of the powder; the examination of which he promised himself would discover what the stone was of which they were formed. And this was the more worthy of a diligent inquiry, since the *petuntse* might easily be supplied by many of our own earths and sands; nothing being required of that but a substance easily running into a white glass. But the difficulty of vitrifying this other ingredient renders it a thing much more difficult to be supplied by one of the same nature among ourselves. The comparison of these, with other mineral substances, soon proved that they were of the nature of talc; or, in other words, that kaolin was talc powdered, and made up into a paste with water. And to be assured whether the whole mass was talc powdered, or

any thing else with a mixture of talc, he separated the particles of the kaolin by water, and found the small ones wholly the same with the larger; and that the larger, when reduced to powder alone, made with water a paste wholly the same with the kaolin. It is well known, that the fragments of talc have a great resemblance to the pearly part of some shell fishes: and hence unquestionably has arisen the opinion of porcelain being made of sea shells; ignorant persons having seen the talc of kaolin, and taken it for a shelly matter. Talc has not yet been successfully used in any of our European manufactures of porcelain; but it is easy to see, from many unanswerable reasons, that since China porcelain is made of a mixture of vitrifiable and unvitriifiable matter, nothing is so likely to succeed with us in the place of the last of these as talc.

1. We know no substance in the fossil world so difficult to reduce to glass as talc, which, if put into the strongest of our fires, in a crucible, is not to be vitrified, nor even calcined. 2. We know no substance which keeps so much brightness after having passed the fire as talc, or that is of so pure a white; whence we may also learn that it is not to the *petuntse* alone, that the china-ware owes its whiteness, but that the kaolin is instrumental to the giving it that colour. 3. Talc is transparent, nay, and in some degree keeps its transparency after the action of the most violent fire. If we are to make porcelain of a vitrifiable and unvitriifiable matter mixed together, yet it is necessary that the unvitriifiable one should retain its transparency, otherwise it would obscure the mass; and talc is therefore the only known substance qualified for this purpose. Persons who have been at the china works, say, that the porcelain is made of equal quantities of *petuntse* and kaolin, and it is therefore a just and exact semi-vitrification. 4. Talc is well known to have a great flexibility or toughness, and as it is found to preserve this even after it has passed the fire; it is very probable, that it is owing to this property of the kaolin that the china-ware is so much less brittle than glass. Mem. Acad. Par. 1727.

It has been before observed, that we may easily, in Europe, be provided with different substances, which will, in our porcelain manufactures, supply the place of the *petuntse* of China, and talc appears equally qualified to serve instead of the kaolin. For this purpose we may use the common Muscovy talc, or isinglass, used by our miniature-painters to cover their pictures instead of glass, and, by the curious, to preserve objects for the microscope; or perhaps the Venetian talc of the druggists would succeed even better: at least the process is so rational, as to be extremely well worth trying.

But this kaolin is more probably an argillaceous earth, from its forming with water a mass tenacious enough to be made into the loaves into which it is brought over. M. Bommare says, that by analysing some Chinese kaolin, he found it was a compound earth, consisting of clay, to which it owed its tenacity; of calcareous earth, which gave it a mealy appearance; of sparkling particles of mica, and of small gravel or particles of quartz crystals. He says, that he has found a similar earth upon a stratum of granite, and conjectured that it may be decomposed granite. This conjecture is the more probable, as kaolins are frequently found in the neighbourhood of granites. See CLAY, HOACH, and PORCELAIN Earth.

KAO-TCHEOU, in *Geography*, a city of China, of the first rank, in the province of Quang-tong, situated in a delightful and fertile country, on a river, about 36 miles from the sea. The tide ebbs and flows as far as this town, and serves for bringing up to it the Chinese barks. It has in

its district one city of the second class, and five cities of the third. On one side this district is surrounded by the sea, and on the other by mountains; and it abounds with peacocks, and several sorts of birds of prey. In the vicinity of the town is a kind of stone, resembling marble, and representing, naturally, rivers, mountains, trees, and landscapes; this stone is cut into slabs, and formed into tables and other curious pieces of furniture. Crabs are also found on the coasts, similar to those of Europe; but when they are taken out of the water, they become petrified, without any change of their natural figure. The Chinese physicians use them as a remedy against fevers. N. lat. $21^{\circ} 40'$. E. long. $110^{\circ} 4'$.

KAOTCHUEN, a town of Corea; 104 miles N.E. of King-ki-tao.

KAPAR, a town of Prussia, in the circle of Smaland, 10 miles W. of Königsberg.

KAPAW, a town of the island of Borneo, near the E. coast; 100 miles E.S.E. of Nagara.

KAPI, a term in the eastern countries for gate.

Thus the chief gate of the palace of the emperor of Persia is called *jalla kapi*, the Gate of God. Hence also, the officer who has the command of the grand seignior's palace gates, is called *capighi bachi*.

KAPILA, in *Biography*, a very eminent literary character among the Hindoos, and founder of one of their philosophical schools, having many tenets in common with the theories introduced to Europe by Pythagoras, especially that of the unlawfulness of slaying animals to eat, under pretence of a sacrifice; as seemed to have been very extensively practised in India. This benevolent doctrine became so approved, that the grateful Hindoos have deified Kapila; affirming that he was an incarnation of the god Vishnu, under the name of Vasudeva, as Kapila is called in their sacred romances, the Puranas. His theory is named Sankya, which seems a modification of that called Mimansa, which corresponds with the Platonic. These points are slightly touched on in Moer's Hindoo Pantheon, and the same writer, in a posterior work, (*Hindoo Infanticide*), says that "Kapila expounded to the Hindoos the same tenet (the immortality of things) modified, to give it the attraction of variety and novelty. He, as Epicurus did after him, tricked out his theory in so metricalicious a stile, as to have provoked, from more sober reasoners, the opprobrium of atheism." See MIMANSA and SANKYA.

KAPLANIK, in *Geography*, a town of European Turkey, in Macedonia; 60 miles N.E. of Akrida.

KAPLITZ, a town of Bohemia, in the circle of Bechin; 9 miles S.E. of Crumau.

KAPOS, a town of Hungary.—Also, a river which runs into the Danube, six miles from Mohacs.

KAPOSVAR, a town and castle of Hungary, formerly very strong, but now much reduced; 12 miles W. of Altenburg. N. lat. $46^{\circ} 30'$. E. long. $17^{\circ} 51'$.

KAPPAS, a tribe of Illinois Indians, in Louisiana, formerly very numerous. Their country has good pasture. —Also, a town of Louisiana, on the Mississippi; 130 miles S.S.W. of New Madrid. N. lat. $34^{\circ} 36'$. W. long. 91° .

KAPPAS *Old Fort*, situated in Louisiana, at the mouth of the river St. Francis, and built by the French, principally for a magazine of stores and provisions during their wars with the Chickasaws, by whom their Illinois convoys were attacked and destroyed.

KAPRIAN, a town of European Turkey, in Moldavia; 60 miles E. of Jassi.

KAPSBERGER, JOHANNES HIERONIMUS, in *Biography*, a German of noble birth, celebrated by Kircher (*Musurgia*), and by many others, was not more famed for the

number and variety of his compositions, than for his exquisite skill in performing upon almost every species of instrument; but more particularly on the theorbo lute, which seems to have been a new invention in the 17th century. The author's name has not been recorded; but it is said to have been of Neapolitan construction. The difference between the common lute and theorbo, was in the latter having two necks, and thence called in Latin *Cithara bijuga*.

Kapsberger, who assisted Kircher in compiling many parts of his *Musurgia*, is highly praised by that laborious, but often credulous and visionary author; but, according to Bapt. Doni, Kapsberger was loquacious and presumptuous. The truth is, that the practical musician and the dilettante theorist were rivals in the favour of cardinal Barberini, afterwards Urban VIII., a lover and patron of music. Both the disputants were reformers, but with different views: Doni, a credulous believer in the miraculous powers of the music of the ancients, without understanding the modern; and Kapsberger, an innovator, who wished to have the compositions of Palestrina banished the church, in order to make way for his own. The feuds of musicians and their partisans are seldom worth recording; as it often happens that they are unable to explain to the public the cause of their difference.

KAPSDORF, in *Geography*, a town of Hungary; 26 miles N.N.W. of Cassovia.

KAPTICRO, an island in the gulf of Bothnia, near the E. coast, about eight miles long and two broad; 2 miles W. of Wafsa.

KAPTSCHAK, a large and well-compact state, which Banty, the kinsman of the great Tchingis or Zingiskhan, founded, about the year 1240, fell, in the year 1441, into four khanates, viz. Kazan, Astrachan, Kaptschak, and the Krim. The first of these were, somewhat more than 100 years afterwards, conquered by the Russians; but the fourth of these states preserved its independency above 230 years longer. At present, however they altogether form a part of the Russian empire. The khanate of Kaptschak, which, from the time of its separation in 1441, has had its principal seat in the plain, which is now called the Astrachan-steppe, fell first. So long ago as the year 1506, it lost its last khan, and was divided among the sovereigns of Kazan, Astrachan, and the Krim, on which at length it came to Russia by the conquest of the two former states. These repeated subjugations had reduced the Kaptschak Tartars to an insignificant residue, which, now removed from its ancient homestead, dwells among Bashkirs and Kirghises, though still retaining its appellation, and the memory of its origin. Tooke.

KAR, a town of Persia, in the province of Irak; 156 miles N. of Isfahan.

KARA, a river of Russia, which runs into the Karakoi sea, at Karakoi. —Also, a town of Hindoostan, in Guzerat; 60 miles S.W. of Gogo. —Also, a town of Hindoostan, in Berar; 8 miles N. of Chanda.

KARA-AGATZ, a town of European Turkey, in Romania; 6 miles S. of Adrianople.

KARA-BAGAN, a town of Asiatic Turkey, in Natioia; 24 miles S. of Milets.

KARABAGH, or the *Black Garden*, a mountainous province of the principality of Georgia, south of the river Aras.

KARABAS, a mountain of Grand Bucharia; 50 miles N.W. of Samarcand. —Also, a town of Persia, in the province of Irak; 70 miles S.S.W. of Hamadan.

KARABASAR, a town of Russia, in the government of Tauris; 35 miles N.E. of Baraderay.

KARA.

KARABAZARI, a town of Asiatic Turkey, in Natolia; 20 miles W. of Kiangari.

KARABE. See CARABE.

KARABEL-SHEH, in *Geography*, a town of Persia, in the province of Mazanderan, on the coast of the Caspian sea; 60 miles E. of Fehrad.

KARA-BIGNAR, a town of Asiatic Turkey, in Carmania; 20 miles S. of Akferai.

KARABIOW, a town of Poland, in Podolia; 12 miles N. of Kamniec.

KARABOA, a town of Asiatic Turkey, in Natolia; 24 miles W. of Artaki.

KARABOGAS, a bay on the E. side of the Caspian sea, 40 miles long and 25 broad, the water of which is very bitter. N. lat. $41^{\circ} 45'$. E. long. $54^{\circ} 44'$.

KARABOULAKI, a town of Georgia, in the province of Carduel; 45 miles S. of Gori.

KARABUNAR, a town of Asiatic Turkey, in Carmania; 40 miles E. of Cogni.

KARAC, a town of Arabia Petraea, on the river Safia; 90 miles S. of Jerusalem. N. lat. $30^{\circ} 44'$. E. long. $35^{\circ} 45'$.

KARACAL, or CARACALLA, a town of Walachia; 60 miles S.W. of Bucharest.

KARACUZ, a town of Persian Armenia; 22 miles E.S.E. of Erivan.

KADERA, a town of Asiatic Turkey, in Diarbekir; 10 miles S.S.E. of Merdin.

KARADJEHLAR, a town of Asiatic Turkey, in Natolia; 36 miles S.W. of Castamena.

KARADJUK, a town of Natolia; 20 miles S.E. of Degnizlu.

KARADRO, a town of Asiatic Turkey, in Carmania; 50 miles W.S.W. of Selefké.

KARADSHELAR, a town of Natolia; 40 miles N. of Angura.

KARAEVIAN, a town of Russia, in the government of Perm; 64 miles S.S.W. of Ekaterinograd.

KARAGANSKOI, CAPE, a cape on the E. coast of the Caspian sea. N. lat. $44^{\circ} 20'$.

KARAGINSKOI, an island in the N. Pacific ocean, near the N.E. coast of Kamtschatka, about 80 miles in circumference. N. lat. 59° . E. long. $162^{\circ} 14'$.

KARAGODE, a town of the island of Ceylon; 86 miles S. of Candy.

KARAGOL, a town of Grand Bucharia, seated on a lake; 24 miles S.W. of Bucharia.

KARAH, a town of Arabia, in the province of Nedsjed; 300 miles E. of Mecca.

KARAHUM, a town of Bengal; 13 miles N.W. of Toree.

KARAHISSAR, a town of Asiatic Turkey, in Carmania; 38 miles S. of Yurcup. See APHIOM, &c.

KARA-HOTUN, a town of Tartary, in the country of the Monguls; 120 miles N.W. of Peking. N. lat. $41^{\circ} 16'$. E. long. $121^{\circ} 53'$.

KARAJIN, a town of Poland, in the palatinate of Braclaw, near the Bog; 50 miles S.E. of Braclaw.

KARAI, a town of Sweden, in the province of Savolax; 35 miles N.N.W. of Nyfot.

KARAITES. See CARAITES.

KARAKAJI, in *Geography*, a town of Georgia, in the province of Kaketi; 80 miles S.E. of Teflis.

KARAKAKOOA BAY, a bay on the W. side of the island of Owhyhee, one of the Sandwich islands, situated in a district called Akona. It is about a mile in depth, and bounded by two low points of land, at the distance of half

a league, and bearing S.S.E. and N.N.W. from each other. On the N. point, which is flat and barren, stands the village of Kowrowa; and in the bottom of the bay, near a grove of tall cocoa-nut trees, there is another village of a more considerable size, called Kakooa; between them runs a high rocky cliff, inaccessible from the sea-shore. On the S. side, the coast, for about a mile inland, has a rugged appearance; beyond which the country rises with a gradual ascent, and is overspread with cultivated inclosures, and groves of cocoa-nut-trees, where the habitations of the natives are scattered in great numbers. The shore, all round the bay, is covered with a black coral rock, which makes the landing very dangerous in rough weather, except at the village of Kakooa, where is a fine sandy beach, with a "morai," or burying-place, at one extremity, and a small well of fresh water at the other. This bay, appearing to Capt. Cook a proper place to refit the ships, and lay in a fresh supply of water and provisions, he caused them to move on the N. side, about $\frac{1}{4}$ of a mile from the shore, Kowrowa bearing N.W. This was in January 1779. The natives came from the shore in astonishing numbers, and expressed their joy by singing and shouting, and exhibiting a variety of wild and extravagant gestures. Capt. Cook was received by the chiefs of the island with a respect, approaching to adoration; and the natives, though they manifested a propensity to pilfering, treated him and his companions with a great degree of hospitality. On the 4th of February, the ships unmoored and sailed out of the bay, being followed on their departure by a great number of canoes. It was the design of Capt. Cook to finish the survey of this island before he visited the other islands, in hopes of finding a road better sheltered than the bay which was now left. But the weather becoming squally and tempestuous, it was found necessary to return to this bay; where the natives manifested a very different disposition from that which they had discovered on the first visit. They now appeared hostile, and adverse to every exercise of hospitality. Several circumstances occurred, which served to widen the breach between the islanders and Capt. Cook; and it was found necessary to recur to the use of arms. For subsequent particulars, and an account of the unfortunate death of the commander, see his biographical article.

KARAKALPAKS, a tribe of Tartars settled in Russia, who called themselves Kara-Kiptschaks, and inhabit the districts on the Syr Darya, a considerable river springing from the lake Aral. They divide themselves, according to their position, into the upper and the nether horde. Previous to the origin of the Kazanian khanate (see KAZAN), they removed to the Volga; where, pressed by the Nogays, they marched like the Chivinses, not as other nations did to the west, but back towards the east, into their present seats. About the year 1742 the nether horde, then consisting of 30,000 kibitkas, implored the Russian protection; but the Kirghises, against whom they were desirous of securing themselves, took such sanguinary vengeance, that the greater part of them was exterminated, and those who remained were obliged to return to the upper horde. As they seldom have the courage to flee from the Kirghilian captivity, their number in Russia is very small. Tooke's Russ. Emp. vol. i.

KARAKAN, a town of Kurdistan; 10 miles S.W. of Betlis.

KARAKECHIS, a town of Persian Armenia; 48 miles N.E. of Erivan.

KARAKERMAN, a town of European Turkey, in Bulgaria; 36 miles S.S.E. of Ismail. N. lat. $44^{\circ} 45'$. E. long. $29^{\circ} 58'$.

KARAKITA, a small island in the East Indian sea, belonging

longing to the king of Ternate. N. lat. $3^{\circ} 6'$. E. long. $125^{\circ} 24'$.

KARAKUM, or the *Black Sand*, the name of a great desert, which forms the northern boundary of Khorasan and modern Persia.

KARAKUODY, a town of Persia, in the province of Schirvan; 20 miles S. of Seamachie.

KARALANSKA, a town of Russia, in the government of Irkutsk, on the Tunguska; 72 miles N.W. of Ilmsk.

KARALEJANGO, a town of Africa, in Kaarta. N. lat. $14^{\circ} 20'$. W. long. $6^{\circ} 20'$.

KARALUKALA, a town of Turkish Armenia, in the government of Erzerum; 30 miles E. of Erzerum.

KARAMAN, a town of European Turkey, in Bulgaria; 35 miles E.S.E. of Nicopoli.

KARAMEISCHEVO, a town of Russia, in the government of Tver; 72 miles N. of Tver.

KARAMIT, a town of Natolia; 30 miles E.S.E. of Macri.

KARAMUSAH, a town of Natolia, on a bay of the sea of Marmora; 36 miles N.N.E. of Burfa.

KARAN, a town of Africa, in Benin, in which is a manufacture of fine cloth.

KARANKALLA, a town of Africa, in Kaarta; 10 miles W. of Kemmoo.

KARANESEBES, a town of Hungary, on the Temis; 38 miles E.S.E. of Temiswar.

KARASBAG, a town of Persian Armenia; 174 miles E.S.E. of Erivan.

KARASM, or CHARASM, a country of Asia, bounded on the N. by Turkestan, on the E. by Grand Bucharia, on the S. by Khorasan, and on the W. by the Caspian sea; about 320 miles from N. to S. and about as much from E. to W. The country is in general fertile, and is divided among several Tartarian princes, one of whom takes the title of khan, assuming pre-eminence over the rest. The capital is Urkonje, which is the usual residence of the khan in winter; but in summer he usually encamps on the sides of the river Amol; his camp being called Khiva. He is said to be able to raise forty or fifty thousand horsemen. This country was formerly full of cities, towns, and castles, strong and populous: it was then a province of the Persian and Arabian empires; but it was probably most flourishing, when it subsisted as an independent kingdom, under the family of the Kharasim khans, who, by conquest annexed to it the whole of Iran, or Persia at large, and Turan, or the countries N. of the Gihon or Amu, thus forming a great empire, of which Urkonje was the capital. At present its cities are few, and much reduced by the desolating power of the Usbecks, who have introduced poverty and distress wherever they have settled.

KARASU, a town of Asiatic Turkey, in Caramania; 100 miles S.E. of Yurcup.—Also, a river of Persia, called *Karansu*, which rises in the N.W. part of the province of Irak, and runs into the Tigris, near Bassorah, anciently called *Euleus* and *Choaspes*.—Also, a river of Asiatic Turkey, called *Koremoz*, which rises near Kaifarieh in Caramania, and runs into the Euphrates near Ilija.

KARAT, a town of Arabia, in the province of Oman; 190 miles S.W. of Maseat.

KARAT. See CARAT.

KARATA, by some called *caraguata maca*, a kind of aloe growing in America; whose leaves, when boiled, are made into a thread, of good use for making cloth, fishing nets, &c. Its roots or leaves, thrown into the water, stupify the fishes to that degree, that they are easily taken with the

hand; its stalk, when dried and burnt, serves for tinder; and when briskly rubbed on a harder wood, it takes fire, and consumes itself.

KARATAS, in *Botany*, Plum. Gen. 10. t. 33, the West Indian name of a fine plant referred by Linnæus to *Bromelia*; see that article, sp. 2.

KARATCHIN, in *Geography*, a Russian ostrog, in the peninsula of Kamtschatka; fifty miles from Bolcheretskoi. It is pleasantly situated by the side of the river Awatska, and consists of three log-houses, three jouts, or houses made under ground, and nineteen balagans, or summer habitations. The inhabitants are a singularly hospitable people.

KARATOPE, a town of Hami, in Chinese Tartary; 30 miles W. of Hami.

KARAT-SIRIM, a town of Curdistan; 40 miles S.E. of Kerkuk.

KARATUIN, a town of Persia, in the province of Irak; 40 miles N.E. of Nehavend.

KARAULNOI, a town of Russia, in the government of Kolivan, on the Genisei; 60 miles S. of Krasnoiarik.

KARAVUN, a town of Hindooistan, in Dooab; 40 miles W. of Pattary.

KARBENING, a town of Sweden, in Westmannland; 30 miles N. of Stroemsholm.

KARBY, a town of Sweden, in West Bothnia; 20 miles N. of Lulea.

KARCARA, a town of Persia, in Segestan; 70 miles N.W. of Zareng.

KARCOJA, a town of Persia, in Segestan; 21 miles N.W. of Zareng.

KARCZOW, a town of the duchy of Warsaw; 16 miles S.W. of Czersk.

KARDAMA, in *Hindoo Mythology*, a being sometimes said to have been an *avatara* or incarnation of the god Siva, and to have been produced by Brahma's shadow; sometimes he is said to be one of the Rishis. See RISHI.

KARDANAH, in *Geography*. See BELUS.

KARDGHA, the name of a short sword held in the hand of Hindoo deities of avenging character; the sacrificial weapon.

KARDUH, in *Geography*, a town of Persia, in the province of Kerman; 56 miles N. of Matih.

KAREDJUK, a town of Asiatic Turkey, in Natolia; 20 miles S.S.W. of Degnizlu.

KAREK, a town of Persia, in Segestan; 30 miles S. of Fusheng.

KAREK, a town of Persia, in the province of Laristan; 42 miles S. of Lar.

KAREK, or GARAK, an island situated on the E. coast of the Persian gulf, between Abu Schehr and Bender Rigk, containing only a single village; but appearing, from its aqueducts cut in the rocks, to have been formerly more populous in proportion to its extent, which is about five leagues in circumference. The Dutch, who once had a settlement here, made the island famous, by carrying on a great trade from hence to Bassora, under the direction of baron Knipphausen. But Mir Mahenna, prince of Bender Rigk, having made an unsuccessful attempt upon the island, at length concluded a peace with the Dutch governor, who was the second in succession to Knipphausen, and the Dutch trade for some time met with no interruption. At a subsequent period Mir Mahenna made a descent upon Karek, and besieged the town. The Arab, having outwitted Van Houting, the Dutch governor, entered the fort with a small retinue, in order to settle terms of accommodation; and having made the Dutch garrison prisoners, sent them to Bata-

via.

via. This event happened in the end of December 1765. Vessels sailing to Ballorah generally touch at this island for a pilot. N. lat. $29^{\circ} 15'$. E. long. $50^{\circ} 26'$.

KAREMPI, CAPE, *Karempibaran*, or *Cape Pifello*, a cape on the coast of Natolia, in the Black sea. N. lat. $42^{\circ} 20'$. E. long. $33^{\circ} 10'$.

KARENDAR, a town of Persia, in the province of Khorasan; 210 miles N. of Herat.

KAREPOS, a town of Russia, in the government of Archangel; 60 miles N.E. of Archangel.

KAREVON, a town of Persia, in Faristan; 35 miles N.E. of Pasa.

KAREZIN, a town of Persia, in Faristan; 60 miles S.E. of Bender Rigg.

KARFE, a kind of cinnamon.

KARGALDZIN, in *Geography*, a lake of Russian Tartary, 60 miles in circuit; 340 miles S. of Orenburg.

KARGAPOL, a town of Russia, on the N. side of the lake Latcha. N. lat. $61^{\circ} 30'$. E. long. $38^{\circ} 50'$.

KARGERD, a town of Persia, in the province of Khorasan; 16 miles N.W. of Fusheng.

KARGERON, a town of Persia, in the province of Ghilan; 60 miles N.N.W. of Reshd.

KARGHI, a town of Asiatic Turkey, in Natolia; 27 miles N.E. of Kiangari.

KARGINIGI, a town of Russia, in the government of Olonetz; 32 miles W. of Vitegra.

KARGO, a province of Africa, in the kingdom of Loango, famous for its mines of excellent copper.

KARIADEH, a town of Natolia, in the gulf of Smyrna; 18 miles W. of Smyrna.

KARJALA, a town of Sweden, in the government of Abo; 23 miles N. of Abo.

KARIATAIN, a town of Arabia, in the province of Nedsjed, anciently Kirjathjearim; 300 miles E. of Medina.

KARIATEIN, a town of the desert of Syria; 60 miles S. W. of Palmyra.

KARIBAZARI, a town of Natolia; 18 miles W. of Kiangari.

KARIKAL, or CARICAL, a town of Hindoostan, on the coast of the kingdom of Tanjore, situated on one of the branches of the Cauvery; ceded by the king of Tanjore to the French. It contains five mosques, 14 pagodas, and about 500 inhabitants. It was taken by the English in 1760, and retaken in 1779; six miles S. of Tranquebar.

KARINAI, a town of Sweden, in the government of Abo; 20 miles N.E. of Abo.

KARINKULA, a town of Africa, in Bambouk. N. lat. $13^{\circ} 36'$. W. long. $9^{\circ} 50'$.

KARIS, a town of Sweden, in the province of Nyland; 10 miles N.N.E. of Eknas.

KARISTOJO, a town of Sweden, in Nyland; 16 miles N.N.E. of Eknas.

KARK, a town of the Arabian Irak, on the Tigris; 80 miles N.N.W. of Bagdad.

KARKA, a town of Asiatic Turkey, in the government of Sivas; 30 miles S. of Tocat.

KARKARLANG, a small island in the Pacific ocean, belonging to a cluster called Meanges. N. lat. $4^{\circ} 45'$. E. long. $126^{\circ} 59'$.

KARKI, an island in the Mediterranean; six miles W. of Rhodes. N. lat. $37^{\circ} 25'$. E. long. $27^{\circ} 19'$.

KARKOLA, a town of Sweden, in Tavastland; 27 miles E. of Tavasthus.

KARKRONY, a building where the royal manufactures of Persia are carried on.

Here are made their tapestries, cloth of gold, silk, wool, and broadades, velvets, taffeties, coats of mail, fabres, bows, arrows, and other arms. There are also in it painters in miniature, goldsmiths, lapidaries, &c.

KARKU, in *Geography*, a town of Sweden, in North Finland; 35 miles S.E. of Bjorneborg.

KARLANDA, a town of Sweden, in Warmeland; 42 miles W.N.W. of Carlstalt.

KARLE, a Saxon word, used in our laws, sometimes simply for a man, and sometimes for a servant or *chren*.

Hence the Saxons call a seaman a *huscarle*, and a domestic servant a *huscarle*.

KARLE Hemp, a term used by our country people for the latter green hemp.

KARLEBY, GAMLA, in *Geography*, a seaport town of Sweden, in East Bothnia, with a good harbour. It trades principally in hemp, salt, and ship building; 60 miles S.W. of Cajana. N. lat. $63^{\circ} 50'$. E. long. $23^{\circ} 1'$.

KARLEBY, Ny, a town of Sweden, in East Bothnia, seated on the river Lappojock, about five miles from the sea, built in 1620 by Gustavus Adolphus; 70 miles S.W. of Cajana. N. lat. $63^{\circ} 32'$. E. long. $22^{\circ} 26'$.

KARLUTZKA, a town of Russia, in the government of Irkutsk; eight miles E. of Nizosi Udiak.

KARLY, a village situated on the road between Bombay and Poona, having in its vicinity a lofty hill, in which are some excavations that have not, until within these few years, come under the notice of Europeans. The hill is named Ekvera, and is two or three miles to the N.E. of Karly, but the excavations are generally called by the name of the vi lage. The late Mr. Wales, a very respectable artist, was the first European who explored this magnificent cavern-temple, of which he made several accurate sketches, and copied several inscriptions. The sketches have not been published, nor have, we believe, the inscriptions been hitherto explained. Lord Valentia has more recently visited Karly, and in his "Travels" describes the cave, of which a beautiful view and a ground plan are given; and Mr. Salt, who accompanied his lordship, has, in his elegant series of oriental views, given two of this beautiful temple. Major Moor, who has also frequently visited it, has given a plate of some of its sculptures in his Hindoo Pantheon. There are many apartments scooped out of the rock in an elevated situation, having flat tops, as usual in most of the Indian excavations; but the grand apartment of Ekvera is arched, and of a most striking and magnificent description. "Its size, and the peculiarity of its form," says lord Valentia, "struck me with the greatest astonishment. It consists of a vestibule of an oblong square shape, divided from the temple itself, which is arched and supported by pillars. The length of the whole is one hundred and twenty-six feet, the breadth forty-six feet. No figures of any deities are to be found within the pagoda, but the walls of the vestibule are covered with carvings, in alto-relievo, of elephants, of human figures of both sexes, and of Budha, who is represented in some places as sitting cross-legged, in others he is erect, and in all attended by figures in the act of adoration; and in one place, two figures standing on the lotus are fanning him, while others hold a rich crown over his head. I think, therefore, that it is beyond dispute, that the whole was dedicated to Budha." Travels, vol. ii. p. 163. (See BOODH.) The farther end of the cave is round, the sides straight; a row of pillars, ten feet from the sides, support kneeling elephants, on which are seated human figures, all beautifully sculptured. From a cornice, running the whole length of the temple over the heads of the figures, spring ribs of wood forming an arch, and touching in its whole concavity the roof

roof which they seem to support. This is a singularity not known to exist elsewhere. The wooden ribs are not more than three feet apart, and about two in depth, and nine inches thick, and have something the appearance of a ship's bottom, inverted. They run parallel to each other, forming a fine arch, from side to side of the apartment. The pillars are sixteen in number on each side, with a space between equal to the diameter of their ball, *viz.* about four feet. The pedestals are square, the shafts polygonal. Seven plainer columns continue the line at the end: on them rests an architrave, whence an arch springs inwards, forming a roof over the altar, as it may be called, which in the Hindoo Pantheon is said to "consist of a vast hemisphere of stone, resting on a round pedestal of greater diameter, and having its convexity surmounted by a sort of canopy or umbrella of peculiar construction. The principal arched temple of Kenera is exactly on the same plan of that here described, and the altar is alike in both. That at Ellora, described by Sir Charles Malet, in vol. vi. of the Asiatic Researches, is also exactly similar in respect to ground plan, but the principal object is different, being Budha himself, with the semi-globe on the round pedestal behind him. In neither of these three arched caves will, I think, be found any sculptures referring to the gods of the Brahmins; and these three are the only caves that I ever saw or heard of constructed with an arched roof. And I presume to hazard an opinion that they are of modern origin, relatively with other excavations at Ellora and on Elephanta, containing, with and without Budha, many of the deities now worshipped by the Brahmins.

"What I would hence infer is, that in the older sculptures we find Budha mixed with the other Hindoo gods: Elephanta and the flat-roofed Pantheistic temples at Ellora, I reckon among the oldest. In sculptures more modern, Budha, as a deity, is often seen exclusively portrayed; the arched caves of Ellora, Karly, and Kenera, I judge to be of later date; and as to form and proportion, of more refined and elegant construction. May we not be allowed, from these premises, to deduce a farther confirmation of the idea that the Budha incarnation of Vishnu, and the sectarial deity of that name, exclusively worshipped by so many different nations under so many different forms and designations, are one and the same person? and that such exclusive worship, and its accompanying ceremonies and privations, is a heresy or reformation, or whatever it may be termed, of the more ancient Brahminical religion? Among European as well as Indian enquirers, this opinion will find the most numerous, but, like other majorities, not the most zealous supporters.

"Sir Charles Malet's plate of Ellora gives exactly a representation of the temples of Karly and Kenera as far as regard ground-plan and general design; and they must certainly have originated in the same person, as one has been taken from the other. The capitals of the interior pillars, from which the arched roofs spring, are different: at Ellora they appear to be men in the act of adoration; at Karly the entablatures are elegantly formed of figures of men and women seated on kneeling elephants, whose probosci, joining at the angles, form, in graceful curves, the volutes of the capitals." P. 245.

In Mr. Daniel's publications of oriental scenery, unrivalled in elegance by any production of the British press, are a series of views of Ellora, finished from the sketches of Mr. Wales. To these we refer such as desire a faithful picture of these truly wonderful excavations, of which some account occurs in an earlier volume, under the article ELLORA. See also ELEPHANTA, (in which article we will here no.

tice an error in the ancient and native name of this curious and interesting island, which is Ghari-puri, or Gari-pouri, and not, as misprinted, Gari-pouli,) and KENERA for some farther particulars of the cavern-temples of India.

KARM, an island in the North sea, about 12 miles long, and two wide, near the coast of Norway. N. lat. 59° 17'. E. long. 5° 32'.

KARMALA, in *Hindoo Mythology*, a servant or minister of Yama, the judge of departed spirits. See YAMA.

KARMEELIS, in *Geography*, a town of Curdistan; 12 miles E. of Mosul.

KARMATIANS, an Eastern sect which bore an inveterate malice against the Mahometans, and began to raise disturbances in the year of the Hegira 278. It is said to have originated with a poor person, called Karmata, who came from Chusistan, in Persia, to the villages near Cufa, and there feigned great strictness and sanctity; alleging that God had enjoined him to pray fifty times a day, and pretending to invite people to the obedience of a certain Inam of the family of Mahomet. This course he pursued till he had formed a great party, out of which he chose twelve as his apostles, to govern the rest, and to propagate his doctrines. But as his doctrines promoted idleness, particularly among the husbandmen and peasants, he was seized by the governor of the province, imprisoned, and menaced with death. But this menace having been overheard by a girl, who was one of the governor's domestics, she took the key of the dungeon from under her master's pillow whilst he was asleep, released the prisoner, and returned the key to the place where she had found it. On the following morning, when the fact was known, his adherents announced that God had taken him into heaven. He afterwards appeared in another province, declaring to his followers, that it was not in the power of any one to hurt him: at length, however, his resolution failed him, and he retired into Syria, and was not heard of any more. His sect continued, and it was pretended that he was a true prophet, and that he had left them a new law, which changed the ceremonies and form of prayer used by the Moslems, having introduced a new fast, having allowed them to drink wine, and having dispensed with the obligation of several precepts of the Koran. The precepts of this sacred book they interpreted allegorically. From the year above-mentioned, the Karmatians, under several leaders, gave almost continual disturbance to the Caliphs and their Mahometan subjects for several years, committing great outrages in Chaldea, Arabia, Syria, and Mesopotamia; and at length establishing a considerable principality, which attained its height of eminence and power in the reign of Abu Dhâher, famous for the capture of Mecca, and the indignities offered by him to its temple; but it soon after declined and came to nothing. The Ismaelians of Asia resembled the Karmatians, if they were not a branch of them. These Ismaelians, in 483, possessed themselves of Al Jebâl, in the Persian Irak, under the conduct of Hasan Sabah; and this prince, with his descendants, enjoyed the same for 171 years, till the whole race of them was destroyed by Holagu the Tartar. D'Herbelot. Sale's Koran.

KARMIN, in *Geography*, a town of Persia, in Segestan; 25 miles N.E. of Zareng.

KARMOE, a small island in the North sea, near the coast of Norway. N. lat. 59° 10'.

KARMSUND, a strait in the North sea, between the island of Carmen and the coast of Norway.

KARMUK, a town of Curdistan, on the side of the lake Van; 22 miles N.N.E. of Betlis.

KARNAC. See CARNAC.

KARNE, a town of Africa, in the kingdom of Bornou.

KARNICAR, a town of Grand Bucharia; 20 miles N.E. of Termed.

KARNKOWSKI, STANISLAUS, in *Biography*, celebrated as a Polish writer and statesman, was born in 1525. He was educated for the church, and obtained a bishopric about the year 1563, and upon the death of Sigismund Augustus, king of Poland, in 1572, he promoted the election of Henry of Valois, and, on his reception, made an eloquent harangue to him in the name of the states. After the abdication of this prince, Karnkowski nominated Anne, the sister of the late Sigismund, queen of Poland, and crowned her husband, Stephen Battori, upon the refusal of the primate to perform this office. After this he placed the crown on the head of Sigismund III. prince of Sweden, who was acknowledged by the kingdom. He had already succeeded to the primacy, and, in 1590, he joined a party who were in opposition to the great chancellor, Zamoiscky, and convoked an extraordinary assembly at Kiow, in which he endeavoured to cancel the ordinances of the last diet. This step rendering him unpopular, he was obliged to seek a reconciliation with the chancellor. He died in 1603, at the age of seventy-eight, and was interred in the Jesuits' college at Kalish, which he had founded. As an instructor of youth he did much to reform the systems of education: but as an author he is known by "*Historia Interregni Polonici*," being a relation of the affairs of the interregnum succeeding the abdication of Henry of Valois: "*De Jure Provinciarum, Terrarum, Civitatumque Prussiae*:" "*Epistolæ Illustrissimi Virorum*, lib. iii." This collection of letters is very rare, and is said to contain many important particulars relative to the history of Poland, from 1564 to 1577.

KARNOWL, in *Geography*, a town of Hindoostan, in Bahar; 38 miles N.N.W. of Hajypour. N. lat. $26^{\circ} 17'$. E. long. $85^{\circ} 11'$.

KAROLI, JASPER, in *Biography*, a Hungarian divine, who flourished towards the close of the sixteenth century, was held in high estimation for his talents as a philosopher, theologian, and philologist, and much admired as a preacher. His memory is greatly revered on account of his having translated the bible from the original Hebrew into his native language. This work was published at Hanover, in 4to., in the year 1608, and another impression of it was given to the public from the press at Frankfort, in 8vo., by Albert Molnar. The work has been reprinted very frequently, in different countries, and is still held in high estimation.

KAROLOU-KALA, in *Geography*, a town of Turkish Armenia; 42 miles E. of Erzerum.

KAROP, a town of Russia, in the government of Novgorod Sieverskoi; 28 miles S. of Novgorod Sieverskoi.

KAROS, an island in the Grecian Archipelago, six miles in circumference; 6 miles S.E. of Naxia. N. lat. $36^{\circ} 53'$. E. long. $25^{\circ} 39'$.

KAROTTA, a small island in the Pacific ocean, belonging to the cluster called Meanges. N. lat. 5° . E. long. $126^{\circ} 50'$.

KAROULI, a town of European Turkey, in Bessarabia; 68 miles S.W. of Bender.

KARPILAX, a town of Sweden, in Tavastland; 14 miles N.E. of Jamio.

KARPILOWKA, a town of Poland, in the palatinate of Kiev; 8 miles N.N.W. of Kiev.

KARRIARPOUR, a town of the circar of Gohud; 16 miles N. of Gohud.

KARRIETEN, a town of Arabia, in Yemen; 20 miles S.S.E. of Chamir.

KARROO, a Hottentot name given, in the colony of the Cape of Good Hope, to vast plains, which are inter-

posed between the great chains of mountains. Out of their impenetrable surfaces of clay, glistening with small crystals of quartz, and condemned to perpetual drought and aridity, not a blade of grass, and scarcely a verdant twig, occurs to break the barren uniformity. The hills, by which these surfaces are sometimes broken, are chiefly composed of fragments of blue slate, or masses of felspar, and argillaceous ironstone; and the surfaces of these are equally denuded of plants as those of the plains. Yet, Mr. Barrow observes, that wherever the Karroo plains are tinged with iron, and water can be brought upon them, the soil is found to be extremely productive. Barrow's Africa, vol. ii. p. 32.

KARS, a town of Asiatic Turkey, in Aladulia; 25 miles N.N.E. of Adana.—Also, a town of Persia, in the province of Kerman; 20 miles N. of Sirjian. This is the extreme town on the frontiers of Persia, and though an inconsiderable place, is tolerably fortified.

KARSABOO, a town of Africa, in Bambatra. N. lat. $13^{\circ} 10'$. W. long. $5^{\circ} 35'$.

KARSAMAKI, a town of Sweden, in the government of Ulen; 65 miles S. of Ulea.

KARSEK, an island near the west coast of East Greenland. N. lat. $60^{\circ} 35'$. W. long. $45^{\circ} 20'$.

KARSHAGNI, a fiery expiation among the Hindoos, of which the following account is taken from Moor's Hindoo Pantheon. "Cow-dung is a great purifier on several occasions. It is related in the Agni-purana, that a most wicked person, named Chanyaka, had exceeded every known possibility of salvation. At the court of Indra were assembled gods and holy men; and as they were discoursing on such enormities, Indra, in answer to a pointed question, said that nothing certainly could expiate them except the karshagni. It happened that a crow, named, from her friendly disposition, Mitra-kaka, was present; and she immediately flew and imparted the welcome news to the despairing sinner, who immediately performed the karshagni, and went to heaven. This expiation consists in the victim covering his whole body with a thick coat of cow-dung, which, when dry, is set on fire, and consumes both sin and sinner. Until revealed by the crow, this potent expiation was unknown; and it has since been occasionally resorted to, particularly by the famous Sankara-Charya. The friendly crow was punished for her indiscretion; and forbidden, and all her tribe, ascension to heaven, and was doomed on earth to live on carrion." P. 143. See SANKARA-CHARYA.

KARSKOI, in *Geography*, a settlement of Russia, in the government of Archangel, at the mouth of the Kara; 600 miles E.N.E. of Archangel. N. lat. $68^{\circ} 35'$. E. long. $64^{\circ} 14'$.

KARSKOI Sea, that part of the Frozen ocean which lies between the continent of Russia and Nova Zembla, extending from N. lat. 70° to 75° , and from E. long. 61° to 68° .

KARSKOI Gulf, is a large bay of the Frozen ocean, lying to the south of the Karskoi sea. N. lat. 68° to 70° . E. long. 62° to 69° .

KARSTORP, a town of Sweden, in the province of Smaland; 48 miles S.E. of Jonkioping.

KARSTULA, a town of Sweden, in the government of Wafa; 85 miles E. of Wafa.

KARSUN, a town of Russia, in the government of Simbirsk; 60 miles W.S.W. of Simbirsk.

KARSURUSK, a town of East Greenland. N. lat. $61^{\circ} 10'$. W. long. 45° .

KARSYTSIAK, a town of East Greenland. N. lat. $60^{\circ} 16'$. W. long. 43° .

KARTAL, a town of Asiatic Turkey, in Natolia, on the coast of the sea of Marmora; 40 miles W. of Ismid.

KARTAN,

KARTAN, or **MARTAN**, four small islands in the Arabian sea, at the entrance of the gulf of Curia Muria, bounding it on the S.W. N. lat. $17^{\circ} 30'$. E. long. $54^{\circ} 50'$.

KARTASCHEN, a town of Russia, in the government of Tobolsk, on the Irtysh; 48 miles S. of Tara.

KARTBIRT, a town of Asiatic Turkey, in Diarbekir; 48 miles W.N.W. of Diarbekir.

KARTERON, a town of Syria, on the Euphrates; 10 miles S. of Ofara.

KARTES, a town of Africa, in the country of Whidah; 12 miles E. of Sabi.

KARTIKYA, in *Hindoo Mythology*, the offspring of Siva, whose seed falling through the hands of Agni, the god of fire, into the Ganges, has given rise to other names allusive to his birth, of a very extravagant nature if taken literally, but which are most likely astronomical allegories; he is hence called Agni-bhuva, and Ganga-putra. Kumara, Srimana, and Skanda are others of his names. He arose, say the Puranic legends, on the banks of the Ganges, as bright as the sun, and beautiful as the moon; and it happening that six daughters of as many rajas going to bathe, saw the boy; and each calling him her son, and offering the breast, the child assumed six mouths, and received nurture from all, whence he was called Seshi-matriya, that is, having *six mothers*. Other legends relate, that on the birth of the child he was delivered to the Pleiads to be nursed. The Hindoos reckon but six bright stars in that constellation, which is named *Kritika*. These six offering their breasts, "the six-headed was nurtured, and named Kartikya, the descendant of the Kritikas." See *KRITIKA*.

He is, however, generally esteemed the second son of Siva and Parvati, the god of war, and commander of the celestial armies, and sir William Jones, who spells his name Carticeya, deems him to be clearly the Orus of Egypt and the Mars of Italy; and was convinced that the name Skanda, by which he is called in the Puranas, has some connection with the old Sekander of Persia, whom the poets ridiculously confound with the Macedonian. He is usually represented with six heads and six arms, and sometimes mounted on a peacock. Several plates of him are given in Moor's Hindoo Pantheon; where, and in Af. Ref. vol. i. and Maurice's An. Hist. are many particulars of this warlike deity, from Puranic legends and other authorities. His sakti, or consort, is always called Kaumari, after his name of Kumara.

KARTUNSAI, in *Geography*, a small island in the gulf of Finland. N. lat. $60^{\circ} 30'$. E. long. 27° .

KARTUSH, a town of Turkish Armenia, in the government of Cars; 52 miles N.E. of Ardanoudji.

KARTUTA, a town of Sweden, in the government of Kuopio; 20 miles W. of Kuopio.

KARVIA, a town of Sweden; in the government of Abo; 47 miles N.N.E. of Björneborg.

KARUN, a town of Persia, in the province of Chuzistan; 70 miles S. of Suster.

KARUNA, a town of Sweden, in the government of Abo; 13 miles S.S.E. of Abo.

KARUP, a town of Denmark, in North Jutland; 14 miles N.W. of Aalborg.—Also, a town of Sweden, in the province of Halland; 15 miles S. of Halmstad.

KARZALA, a town of Russia, in the government of Saratov, on the Choper; 80 miles N.W. of Saratov.

KAS, or **GUESS**, called also *Kyn* and *Quefche*, a low fertile island in the gulf of Persia, separated from the continent of Persia by a good channel about 12 miles broad. N. lat. $26^{\circ} 34'$. E. long. $54^{\circ} 4'$.

Kas, *El*, or *Kas Kafaron*, a mountainous cape of Egypt, on the coast of the Mediterranean; 3 miles N. of Catieh. N. lat. $30^{\circ} 58'$. E. long. $33^{\circ} 22'$.

KASABI, a town of Syria, on the Enphrates; 25 miles E. of El Der.

KASAKURA, a town of Japan, in the island of Ximo; 22 miles E.S.E. of Taifero.

KASAN. See *KAZAN*.

KASBAITE, or *GASBAITE*, a town of Algiers, anciently called *Satafa*; 50 miles S.W. of Constantina.

KASCHAN. See *CASHAN*.

KASHGAR. See *CASHGAR*.

KASCHIL, a town of Africa, in the kingdom of Benguela.

KASCHIN, a town of Russia, in the government of Tver; 60 miles N.E. of Tver.

KASCHIRA, a town of Russia, in the government of Tula; 56 miles N. of Tula.

KASCHKARANTZI, a town of Russia, in the government of Archangel, on the White sea; 140 miles N.W. of Archangel.

KASHAKLU, a town of Asiatic Turkey, in Caramania; 55 miles S.W. of Cogni.

KASHAN. See *CASHAN*.

KASHEKA, in the historic legends of the *Hindoos*, is the father of a very renowned ascetic and sage named *Vishnavitra*; which see.

KASHMIR, in *Geography*. See *CASHMIRE*.

KASI, or **KASSI**, sometimes written *Kashi*; a Sanscrit name of the revered city of Benares; the latter popular name being probably a corruption of its classical appellation *Vara-nari*, so called from two rivers that form a junction of waters and name near its site. See *BENARES*.

KASI, a term in the East, applied to the fourth pontiff of Persia, who is also the second lieutenant civil, and judges of temporal as well as spiritual affairs.

He has two deputies, who determine matters of less consequence; particularly quarrels arising in coffee-houses, which make a great part of their business.

KASILAX, in *Geography*, a town of Sweden, in the province of Savolax; 29 miles E. of Nyfot.

KASIMOV, a town of Russia, in the government of Riazan, on the Oka, formerly the residence of a Tartar prince; 76 miles E.N.E. of Riazan.

KASKAREL MELIK, a town of the Arabian Irak; 36 miles N. of Bagdad.

KASKASKIAS, a post-town of America, and the chief of Randolph county, on the S.W. bank of a river of the same name, 12 miles from the mouth of the river; containing about 100 houses, many of which are well built with stone; and 467 inhabitants, of whom 47 are slaves.—Also, an Indian nation near the river of this name in the Indiana territory. In 1774 they could furnish 250 warriors. Three miles northerly of Kaskaskias is a village of Illinois Indians, of the Kaskaskias tribe, containing, in 1774, about 210 persons and 60 warriors. They were formerly brave and warlike, but are now degenerated and debauched. In August 1803, governor Hamilton concluded a treaty with the Kaskaskias Indians, by which they ceded to the United States in full right the immense tract of country extending from the mouth of the Illinois river to the mouth of the Ohio; from thence to the mouth of the Saline creek, below the Wabash; thence bounded by the highlands, dividing the waters which run into the Wabash from those which run into the Saline creek; thence by the highlands dividing the waters which run into the Wabash from those which run into the Mississippi, until it reaches the river Kaskaskia; thence, by the high-

lands, which divide the waters that fall into the Kaskaskia river from those which fall into the river Illinois, and from thence in a direct course to the mouth of the Illinois again; supposed to contain from 10 to 12 millions of acres. The whole was ceded in consideration of the annual addition of 500 dollars to a like sum, which by the treaty of Greenville, the Kaskaskia tribe receives every year from the United States, together with the reservation of 1580 acres near the village of Kaskaskia, for cultivation and domestic purposes; Morfe.—Also, a river of the north-west territory, which is navigable for boats 130 miles. Its course is S.S.W., and near its mouth it turns to the S.S.E. and falls into the Mississippi river, 84 miles from the Illinois. It runs through a rich country, abounding in extensive natural meadows, and numberless herds of buffaloes, deer, &c. Along the east side of the river lie high grounds, the banks being composed of lime-stone and free-stone, and from 100 to 130 feet high, divided in many places by deep cavities, through which many small rivulets pass before they fall into the Mississippi. The sides of these hills fronting the river are in many places perpendicular, and appear like solid pieces of masonry, of various colours, figures, and sizes. Morfe.

KASKASKUNK, a town of the Delawares, between Great Beaver creek and Alleghany river, in Pennsylvania; 40 miles N. of Pittsburg.

KASKEIRA, a town of Persia, in the province of Irak; 25 miles N. of Sava.

KASKINOMPA, a small river which runs W. into the Mississippi from Tennessee, in N. lat. $36^{\circ} 28'$. On the north side of its mouth is an iron mine.

KASKIS, a town of Sweden, in Tavastland; 30 miles E. of Tavasthus.

KASKO, a small island in the gulf of Bothnia, near the coast of Finland. N. lat. $63^{\circ} 16'$. E. long. $90^{\circ} 10'$.

KASKOYAR, a small island in the gulf of Bothnia. N. lat. $63^{\circ} 16'$. E. long. $90^{\circ} 10'$.

KASNICH, a town of Persia, in the province of Khorasan; 12 miles S. of Zauzan.

KASR, a town of Egypt; 6 miles N.N.W. of Ashmounin.

KASR Ahmed, a town of Tripoli, on the coast; 100 miles E. of Tripoli. N. lat. $32^{\circ} 4'$. E. long. $15^{\circ} 20'$.

KASR Kiasera, a town of Egypt, built on the ruins of the ancient Nicopolis, on the coast of the Mediterranean; 5 miles N.E. of Alexandria.

KASSAN, a town of Africa, in the kingdom of Yari, on the N. side of the Gambia; 36 miles N.W. of Pisania.

KASSAR, an island of the Baltic, to the southward of Dago, with a chapel, about 11 versts long and between four and seven versts broad.

KASSERAMANGALUM, a town of Hindoostan, in Baramaul; 17 miles S. of Coveriporum.

KASSGUNGE, a town of Hindoostan, in the Doob; 24 miles N.W. of Pattiar.

KASSINA, or **CASHNA**, a kingdom of Africa, situated N. of the river Niger, between Bornou and Tombuctoo. The two empires of Bornou and Kaffina extend northwards towards Nubia, and comprehend a very considerable space. In both these empires, the sovereigns are Mahometans; but their subjects are said more generally to adhere to the ancient worship; that is to say, the lower orders are, almost universally, Negroes. Kaffina, till of late, was esteemed the first in power; but though a thousand villages and towns are still included in its vast domains, this empire is now considered much inferior to Bornou. The circumstances of soil and climate, and those also which constitute political character, are nearly the same in both; their prevailing winds are the

same; their rains, which are periodical in each, though much more profuse in Bornou, begin at the same season; the same grains are cultivated; the same fruits (generally speaking), are produced; and except that no camels are bred to the westward of the city of Kaffina, the capital of the empire, the same animals are reared. In both, the complexion of the inhabitants is black; their mode of building too is similar, and their manners, though in some respects more civilized in Bornou, have a general resemblance. Each of the two empires is formed by the subjection of different tribes or nations to the dominion of one ruling people. The nature of the government, and the laws which regulate its succession, are the same in both. In both, the ruling people are Mahometans; in both, the dependent nations are composed of converts to the Mussulman faith, and of adherents to the ancient worship; and though at present their languages are different, the conquerors in both had probably the same original. The word Soudan, expressing the land of the Blacks, is by the Arabian geographers applied to the Nigritia of European geographers; but some Africans restrict it to the empire of Cashna, which is N. of the Niger, and others extend it to the Negro states on the S. of the river; and wishing to express the transcendent power and extended rule of the emperor of Cashna, they call him, with extravagant compliment, the sultan of all Soudan. His real sovereignty is bounded on the N. by the mountains of Eyré, and by one of those districts of the great Sahara, that furnish no means of useful property or available dominion; on the S. by the Niger; and on the E. by the kingdom of Zamphara, and the empire of Bornou. Its western limit is not ascertained. There are some circumstances of difference, which, notwithstanding the general resemblance between Bornou and Cashna, discriminate between them. The rains are less violent in the latter than in the former. Cashna exclusively furnishes the Bishnah, a species of Indian corn, that differs from the gamphuly in the blended colours of red and white which distinguish its grain. Its monkeys and parrots (animals seldom seen in Bornou) are numerous, and of various species. The meridian of its capital is considered as a western limit, in that parallel of latitude, to the vegetation of grapes and breeds of camels; for between Cashna and the Atlantic few camels are bred, and no grapes will grow. The manners of the common people are less courteous in Cashna than in Bornou; and their games are less expressive of reflection; for their favourite play consists in tossing up four small sticks, and counting those that cross each other, as so many points of the number that constitutes the game. But the circumstances of chief discrimination between the two empires, are those of language, currency, and certain articles of commerce. Many words occur in one language which are not found in the other. The currency of Cashna, like that of the Negro states S. of the Niger, is composed of those small shells called cowries. Of these shells, 2500 are estimated as equal in value to a miktal of Fezzan, which is worth about 75 piastres of Tripoli, or 10s. $1\frac{1}{2}$ d. sterling. Among the few circumstances which characterize the trade of Cashna, as distinguished from that of Bornou, the most remarkable is, that the merchants of the former kingdom are the sole carriers to other nations, of a scarce and most valuable commodity, which is only to be obtained from the inhabitants of the latter. For though the salt of Bornou supplies the consumption of Cashna, and of the Negro kingdoms to the south, yet its owners have abandoned to the commercial activity of the merchants of Agadez the whole of that profitable trade. The lakes, on the dreary shores of which this scarce article of African luxury is found, are separated from Agadez by a march of 45 days, and are encompassed on all

sides

hides by the sands of the vast desert of Bilma, where the ardent heat of a flaming sky is returned with double-s fierceness by the surface of the burning soil. A thousand camels, bred and maintained for the purpose, are said to compose the caravans which annually explore, in the savage wilderness, the long line of this adventurous journey. Perilous however, and full of hardships as their labour is, the merchants find an ample recompence in the profits of their commerce; for while the wretched villagers who inhabit the neighbourhood of the lakes, and collect the salt that congeals upon the shores, are contented to receive, or obliged to accept a scanty price, the value which the merchants obtain in the various markets of Cashna, Tombuctoo, and of the countries S. of the Niger, is suited to the high estimation, in which the article is held. The people of Agadez are equally anxious to avail themselves of the productions of their own country. Accordingly, being well apprised of the superior quality of the fenna, which grows upon these mountains, they demand and receive from the merchants of Fezzan a proportionable price. From Tripoli this fenna is conveyed to Turkey, Leghorn, and Marseilles. Of the other articles of sale which the extensive empire of Kaffina affords, the principal are gold-dust, slaves, cotton cloths, which are the general manufacture of Cashna, Bornou, and the Negro states S. of the Niger, goat-skins of the red and yellow dyes, ox and buffalo hides, and civet; and in return for these, the inhabitants of Kaffina receive cowries, horses, and mares, red woollen caps, check linens, light coarse woollen cloths, baize, barakans or alhaiks, small Turkey carpets, plain Mesurata carpets, silk, wrought and unwrought, tissues and brocades, fabre blades, Dutch knives, scissors, coral, beads, small looking-glasses, tiches, or a paste prepared in Fezzan, from dates and the meal of Indian corn, and which, whenever they travel, is in great request among the people of Fezzan; and Gooroo nuts, which are brought from the Negro states on the S. of the Niger, and which impart a pleasant bitter to any liquid in which they are infused.

The Fezzaners, equally connected by their commerce with Cashna and Bornou, dispatch to the former as well as to the latter, and always at the same season, an annual caravan. From Mourzouk, their capital, which they leave at the close of October, they take their course to the S.S.W. and proceed to the province of Hiatts, the most barren, and the worst inhabited district of their country. From Hiatts they cross the low mountains of Eyré, which separate the kingdom of Fezzan from the empire of Cashna, and next arrive at the town of Ganatt, where they repose for two days. From thence, by a march of 19 days, during six of which they are exposed to the scorching heats of a thirsty desert, they pass on to the town of Assouda. On leaving Assouda, they traverse a delightful country, fruitful, and populous; and while the exhilarating sight of Indian corn, and of frequent herds of cattle accompanies and cheers their passage, the eighth day introduces them to the large and populous city of Agadez, the capital of an extensive province. Distinguished as the most commercial of all the towns of Cashna, and, like Assouda and Ganatt, inhabited by Mahometans alone, Agadez naturally attracts the peculiar attention of the merchants of Fezzan. Many proceed no farther; but the greatest part, committing to their agents the care of the slaves, cotton, and fenna, which they purchase in the course of a 10 days' residence, continue their journey to the south. In this manner, if the camels are completely loaded, 47 days, exclusive of those which are allotted to refreshment and necessary rest, are employed in travelling from Mourzouk to Agadez. At the end of three days more, amidst fields that are enriched with the luxuriant growth of Indian

corn, and pastures that are covered with multitudes of cows, and with flocks of sheep and goats, the traveller reaches the small town of Begzam; from which, through a country of herdsmen, whose dwellings are in tents of hides; the second day conducts him to the town of Tegomah. There, as he surveys the stony, uninhabited, desolate hills that form the cheerless prospect before him, he casts a regretful eye on those verdant scenes that surrounded him the day before. Employed for two days in the passage of these dreary heights, he descends on the third to a deep and scorching sand, from which he emerges at the approach of the fifth evening, and entering a beautiful country, as pleasingly diversified with the natural beauties of hills and vales and woods, as with the rich rewards of the husbandman's and the shepherd's toil, he arrives in seven days more at the city of Cashna, the capital of the empire of which it bears the name, and the usual residence of its powerful sultan.

The river Niger traverses the empire of Cashna with such rapidity, that no vessel can ascend its stream; and such is the want of skill, and such the absence of commercial inducements among the inhabitants of its borders, that even with the current, neither vessels nor boats are seen to navigate. In one place, indeed, the traveller finds a passage for himself and his goods; but even there, though the ferrymen, by the indulgence of the sultan of Cashna, are exempted from all taxes, the boat which conveys the merchandize is nothing more than an ill-constructed raft; for the planks are fastened to the timbers with ropes, and the seams are closed, both within and without, by a plaster of tough clay. The depth of the river, at the place of passage, which is more than 100 miles to the south of the city of Cashna, is estimated at 23 or 24 feet English. (Proceedings of the African Association.) The city of Cashna, or Kaffina, is distant 650 miles W.S.W. from Bornou, and 690 miles E.S.E. from Tombuctoo. N. lat. 16° 30'. E. long. 11° 34'.

KASSON, a strong hilly country of Africa, of small extent, bounded on the N. by the Moors of Jassnoo, on the E. and S.E. by Kaarta, on the S. by the Senegal, and on the W. by Kajaaga; about 50 miles from N. to S., and nearly the same from E. to W. N. lat. 14° to 15°. W. long. 8° to 9°.

KASSUTO, an African musical instrument, composed of a hollow piece of wood, about an ell long, covered with a plate cut into a kind of scale, upon which the negroes beat with a stick. See *Music of the NEGROES*.

KAST, in *Geography*, a town of Persia, in Segestan; 40 miles S.W. of Arokhage.

KASTANOVITZ, a town of Croatia, situated on an island in the river Unna; 50 miles S.E. of Carlstadt.

KASTHOLM, a town of Sweden, on the S.E. coast of the island of Aland.

KASTRICAUR, CAPE, a cape on the N.E. coast of the Company's island, in the North Pacific ocean. N. lat. 46° 30'. E. long. 151° 40'.

KASTRIL, in *Zoology*. See **KESTRIL**.

KASYA, in *Hindoo Mythological History*, was the Guru, or spiritual preceptor of Krishna, of whose wife the following legend occurs in the Pedma Purana, and in the Sri Bhagavat among the strange miracles recorded of this incarnate deity. She complained to Krishna that the ocean had swallowed up her children on the coast of Gurjura, or Guzerat, and supplicated their restoration. Krishna, proceeding to the coast, was assured by Varuna, the regent of the ocean, that not he, but the sea-monster, Sankasura, had stolen the children. Krishna fought, and after a violent conflict, slew the demon, and tore him from his shell, named Panchajanya, which--

which he bore away in memorial of his victory, and used afterwards in battle by way of trumpet. (See SANKASURA.) Not finding the children in the dominions of Varuna, he descended to the infernal city, Yama-puri, and founding his tremendous shank, or shell, (see SHANK,) struck such terror into Yama, that he ran forth to make his prostrations, and restored the children of Kasya, with whom Krishna returned to their delighted mother.

KASYAPA, an important character, who, in indifferent theogonies, assumes different lines of parentage and character. In the Siva-purana he is made the great-grandson of Brahma, Marichi and Bhriгу being his immediate ancestors: and he is there feigned to have married thirteen of Daksha's sixty daughters, an astronomical allegory that has not yet been explained; but alluding, we apprehend, to a cycle of sixty years in all among the Hindoos. Sir William Jones suspected, and Mr. Wilford has proved the whole fable of Kasyapa to be astronomical, and the same with the Cassiopeia of the Greeks. Kasyapa, in some points, corresponds in character with Uranus; Marichi, the offspring of Brahma, being a personification of Light. Surya, or the Sun, is sometimes found mentioned as the sun or offspring of Kasyapa, and sometimes he is included in the list of the seven Rishis; in other relations he is the husband of Diti, and the parent of Indra, Aruna, Garuda, and many of the minor deities. In Vishnu's avatara of Vamana, or the dwarf, he became incarnate in the person of Kasyapa's son, by Aditi; and the Nakshatras, or lunar mansions, (see NAKSHATRA,) are, in the Institutes of Menu, attributed to "Kasyapa, the first production of Brahma's head."

KATABA, in *Geography*, a town of Arabia, in the province of Yemen, situated in a fertile country, near a river that runs into the sea at Aden, governed by a dola, and defended by a citadel; 75 miles N. of Aden. N. lat. $13^{\circ} 54'$. E. long. $44^{\circ} 39'$.

KATAL, a town of Asiatic Turkey, in the government of Sivas; 18 miles S. of Sivas.

KATAPANG, a small island in the East Indian sea, near the N. coast of Java. S. lat. $7^{\circ} 39'$. E. long. $113^{\circ} 22'$.

KATAREN, a town of Arabia, in the province of Yemen; 60 miles S. of Saade.

KATENIA, a town of Bengal; 80 miles N. of Dacca.

KATEREVI, a town of the principality of Georgia; 18 miles W.S.W. of Teflis.

KATERINENSCHSTAT, a town of Russia, in the government of Saratov, on the Volga; 32 miles N.E. of Saratov.

KATHTIPPACAMUNCK, an Indian village in America, on the N. side of Wabash river, at the mouth of Ripacanoe creek, and about 20 miles above the Lower Weau towns. In 1791, before its destruction by generals Scott and Wilkinson, it contained 120 houses, the best of which belonged to the French traders. N. lat. $40^{\circ} 20'$. W. long. $87^{\circ} 2'$.

KATIF, a town of Arabia, in the province of Lachfa, of some magnitude, situated upon the coast, at the distance of about five German miles from the isle of Bahrein. The inhabitants earn their subsistence by the pearl fishery; the season for fishing is in the hotter months of the year, when the air is deemed to be very insalubrious.

KATIMBEVOLE, a town of the island of Ceylon; 36 miles S. of Candy.

KATIMTUMU, a town of Russia, in the government of Irkutsk, on the Lena; 60 miles E. of Oiekminsk.

KATIRLI, a town of Natolia; 28 miles N. of Burfa.

KATISTLI, a town of Natolia, on the coast of the sea of Marmora; 36 miles S. of Constantinople.

KATKIN. See CATKIN.

KATMANDU, or CATMANDU, in *Geography*, the capital of Napaul or Nepal, in a province of the same name; called also Jingbu by the people of Thibet. It is placed by Rennell 105 geographical miles nearly N. from Maissy, that is, in latitude $28^{\circ} 6'$. It is 536 British miles from Lassa, or in horizontal distance 346 geographical miles. According to Giuseppe, it contains about 18,000 houses, probably yielding a population of 70 or 80 thousand. (See NEPAUL.) According to colonel Kirkpatrick's account it is seated on the eastern bank of the Bishmatty, along which it runs for a mile, with a breadth not exceeding half a mile. The most striking objects which it presents to the eye are its wooden temples, which are scattered over its environs, and particularly along the sides of a quadrangular tank or reservoir. The colonel says, "there are nearly as many temples as houses, and as many idols as inhabitants." The number of idols, according to his statement, amounts to 2733. Besides these wooden temples, Katmandu contains several others on a large scale, constructed of brick, with two or three sloping roofs, diminishing as they ascend, and terminating in pinnacles, which, as well as some of the superior roofs, are splendidly gilt, and produce a very picturesque and agreeable effect. The houses are of brick and tile, with pitched roofs towards the street, frequently surrounded by wooden balconies, of open carved-work, and of a singular fashion. They are of two, three, or four stories, and generally of a mean appearance. The streets are narrow and filthy. Katmandu, with its dependent towns and villages, according to Kirkpatrick, may contain about 22,000 houses; but the town itself, if ten people be allowed to each house, which he thinks to be a low computation, does not contain more than 50,000 persons. The next most considerable towns of Nepal are Patn, Bhetgong, and *Khirtipoor*. Asiatic Ref. vol. ii. p. 307.

KATNA, a town of Sweden, in Sudermanland; 30 miles S.W. of Stockholm.

KATNEBLOW, a town of Poland, in the palatinate of Kiev; 36 miles S. of Bialacerkiew.

KATNIA-STANITZ, a town of Russia, in the government of Irkutsk; 64 miles N.E. of Vitimskoi.

KATOENE, a town of the island of Ceylon; 64 miles S. of Candy.

KATOU-CARVA, in *Botany*, the name by which some authors have called the tree, whose leaves are the tamalapra, or Indian leaf of the shops. See MALABATHIRUM.

KATOVINDEL, the name given by the authors of the Hortus Malabaricus, to a genus of plants, called by some *elate*, and by Linnæus *phanix*.

KATOUN-SERAI, in *Geography*, a town of Asiatic Turkey, in Caramania; 12 miles S. of Cogni.

KATSCHER, a town of Moravia, in the circle of Pre-rau, with a lordship in Silesia, to which it once belonged; 12 miles W. of Ratibor. N. lat. $49^{\circ} 59'$. E. long. $17^{\circ} 52'$.

KATTA, a town of Bootan; 15 miles S. of Bifnee.—Also, a town of Persia, in Farfistan; 30 miles W.S.W. of Yezd.

KATTAH, a town of Arabia, in the province of Hedjaz; 160 miles E.S.E. of Madian.

KATTAYANI, in *Hindoo Mythology*, a name of Parvati, consort of Siva.

KATTRON, in *Geography*. See GATRON.

KATUADI, a town of the Arabian Irak; 12 miles S. of Bagdad.

KATUNSKAIA, a town of Russia, in the government of Kolivan; 12 miles S. of Büsk.

KATZA, a town of Germany, in the county of Henneberg; seven miles W.N.W. of Meinungen.

KATZEMAUGE, in *Mineralogy*. See CAT's Eye.

KAU, in *Geography*, a town of Africa, in the kingdom of Loango.

KAUADI, an island of Egypt, in lake Berelos; 13 miles N. of Faoue.

KAVARNA, a town of European Turkey, in Bulgaria, in the gulf of Varna; 22 miles N.E. of Varna. N. lat. $43^{\circ} 21'$. E. long. $28^{\circ} 17'$.

KAUBUL, a town of European Turkey, in Bessarabia; 34 miles W. of Akerman.

KAUDER, a town of Hindoostan, in Lahore; 40 miles S.S.W. of Lahore.

KAUDER, a town of Arabia, in the province of Hedjas; 60 miles N.W. of Mecca.

KAVERZINA, a town of Russia, in the government of Tobolsk, on the Tchiuna; 20 miles E.S.E. of Eniseisk.

KAUFFHEUREN, a town of Germany, situated on the Wuttach, and till the year 1802, when it was given to the elector of Bavaria, imperial. The burghers are partly Lutherans, and partly Roman Catholics; but its magistracy consists of eight Lutherans and four Roman Catholics. In the town-court and great council are also two Roman Catholic members, but the rest are all Lutherans; 62 miles E.N.E. of Constance. N. lat. $47^{\circ} 42'$. E. long. $10^{\circ} 35'$.

KAUFFMAN, MARY ANGELICA, in *Biography*, a lady who possessed the talents and taste of a painter in a degree very unusual among her sex. She was a native of Coire, the capital of the Grisons, and born in 1740. Her father was an artist, who, perceiving the extraordinary capacity of his daughter, and how worthy it was of the best cultivation, conducted her, at the age of fourteen, to Milan, and afterwards to Rome; where her talents and accomplishments soon acquired her the most distinguished attention. It was the happy lot of lady Wentworth, the wife of the British resident at Venice, to be the instrument of conveying Angelica to England in the year 1764. Here she was received in a very flattering manner; her works eagerly sought for; and her company solicited by the learned, the great, and the polite. She was honoured with royal attentions, and was esteemed and courted by artists. She was very industrious, and painted the lighter scenes of poetry with a grace and taste entirely her own; and happily formed to meet that of an engraver whose labours highly contributed to the growth and perpetuity of her fame. Bartolozzi was the man, who, enjoying at the same time youth, health, and ingenuity, almost entirely devoted his talents between Angelica and Cipriani. The three were endowed with congenial feelings in arts; which, if not of the highest class, were certainly entitled to rank among the most agreeable.

After some years residence here, she was unhappily deceived by a footman of a German count, who, coming to England, personated his master, contrived to be presented at court, and persuaded Angelica to marry him. The cheat was soon discovered, and the rascal had not the humanity to endeavour to sooth her disappointment by kindness, but treated her very ill. At last, however, by a payment made to him of 300*l.*, he was induced to return to Germany, and promised never to molest her any more. He kept his engagement; and the lady not hearing of him for seven years, and concluding him dead, then married an Italian painter of the name of Zucchi, and having spent seventeen years in England, returned with him to her native country, and thence to Rome; where her house became the resort of genius and

taste; all artists and cognoscenti taking pleasure in being admitted to her conversazioni; while amateurs endowed with rank and wealth were happy in finding employment for her agreeable talents, and in the possession of her works. She lived to the age of 67, and then fell by a gradual decay, under that power which pays regard alike to the great, the learned, the virtuous, and the profligate. She died in 1807, universally regretted, and was honoured by splendid public obsequies.

The talents of Angelica were of a pleasing rather than of a splendid kind. She excelled most, as was most justly to be expected, in the representation of female characters. Her figures of men want form and energy, and their faces and characters are all of the same mould. Grace, ease, and suavity of expression, generally mark her women; and to single figures, such as "Calypso watching the Departure of Ulysses," or "Penelope weeping over his Bow," she imparted the true interest of the story.

KAUGA, in *Geography*, a town of Africa, in a kingdom of the same name, S. of Bornou, traversed by the Niger. The town is situated on a lake, called by Ptolemy "Nubia Palus," in which some have supposed that the Niger loses itself; 225 miles S.S.E. of Bornou. N. lat. $16^{\circ} 10'$. E. long. $24^{\circ} 40'$.

KAUGASNIEMI, a town of Sweden, in the province of Savolax; 35 miles N. of Chrifina.

KAUHAJOKI, a town of Sweden, in the government of Wafa; 24 miles E.N.E. of Chrifinestadt.

KAUHAHA, a town of Sweden, in the government of Wafa; 37 miles E. of Wafa.

KAUHAUT, in *Biography*, an excellent performer on the lute, and perhaps the last eminent musician who highly cultivated that instrument. Signor Colini was the last good performer on the lute in England. We believe that Kauhaut was a German; but he is enumerated by M. Laborde among French composers; he was in the service of the prince of Conti, and composed between 1760 and 1764 several comic operas for the Theatre Italien at Paris. But in 1772 we found him at Vienna, in high reputation as a lutenist.

KAUI, in *Geography*, a town of Persia, in the province of Adirbeitzan; 48 miles N.W. of Tabris.

KAUKEBAN, a small unfortified town of Arabia, in Yemen, but situated on the summit of an almost inaccessible mountain. A causeway has been formed, by which loaded camels can now advance up to the city; 18 miles W. of Sana. The country bearing this name is surrounded almost on all sides by the dominion of the Imam of Sana; only, on one side, it meets the territory of the confederated Scheichs of Haschid-u-bekil. The reigning family are descendants from Mahomet, by Hadi, Imam of Saade. Although they have lost the title of Imam, they still retain sovereign authority over a considerable territory.

KAUKENEN, a town of Prussian Lithuania, on the Kauke, which runs into the Curisch Haff; 12 miles W.N.W. of Tillit.

KAUMARI, in *Hindoo Mythology*, is the faksi or consort of Kumara, or Kartikya, and is represented riding on a peacock, with a lance in her hand. See KARTIKYA and SAKTI.

KAUMBOLI, in *Geography*, a town of Hindoostan, in the circar of Ellore; 12 miles S.S.W. of Ellore.

KAUNITZ, WENZEL ANTONY, in *Biography*, prince of the holy Roman empire, count of Rietberg, knight of the golden fleece, &c. was born at Vienna in 1711. Being a younger child of a large family he was brought up to the church; but on the death of his elder brothers he quitted the

the ecclesiastical profession to enter into the service of the state, in which his ancestors had made a considerable figure. He laid the foundation of his studies at Vienna, and in 1737, was made a counsellor of state, and, two years after, imperial commissioner at the diet of Ratibon. In the year 1742, he was appointed minister plenipotentiary to the court of Sardinia, which had entered into a new alliance with Austria. A treaty was brought to a conclusion by Kaunitz, which induced the court to confer on him offices of more importance. In 1744, he went to Brussels, to undertake the chief management of public affairs, which, at that time, required a man of talents, as the king of France had already declared war, and the Netherlands were the first part of the emperor's dominions exposed to the attack of the French army. In February 1745, he was appointed minister plenipotentiary, and in 1748, he took a part in the signing of the preliminaries of peace at Aix-la-Chapelle. On this occasion he acquired, by his great talents for negotiation, and the noble conduct which he displayed, the respect of all the ministers then present. When peace was concluded, the empress Mary Theresa conferred upon him the order of the Golden Fleece, and appointed him envoy to Paris. During his residence in that city, he laid the foundation of an alliance between France and Austria, which took place some time after. On the resignation of count Uhlfeld, as chancellor of state, Kaunitz was appointed his successor, and recalled from Paris about the end of the year 1752, but at the same time was ordered to return to Brussels, to bring to an end the negotiations in regard to the barriers, which had been carried on a whole year without success. When he had completed this object he returned to Vienna in 1753, and entered upon the official duties of the chancellorship of the state, in addition to those belonging to the supreme dictatorship of the affairs of the Netherlands and of Lombardy, with the rank of minister of state, which he retained till his death. In 1764, he was raised to the dignity of prince of the empire, with descent to his heirs male. He concluded the treaty of alliance between France and Austria in 1766, which put an end to that hostility which had prevailed for several centuries between the two countries. After this he had the sole management of all foreign affairs, and enjoyed the unlimited confidence of the empress Mary Theresa, and afterwards of Joseph II., Leopold II., and Francis II. He died in June 1794, in the 84th year of his age, leaving behind him a very high reputation. Gen. Biog.

KAUNITZ, in *Geography*, a town of Moravia, in the circle of Brunn; eight miles S.W. of Brunn.—Also, a town of Moravia, in the circle of Znaim; 11 miles N.N.W. of Znaim.

KAUNPOUR, a town of Hindoostan, in Moultan; 15 miles N.E. of Moultan.

KAUNUDON, a town of Hindoostan, in Lahore; 20 miles E.N.E. of Callanore.

KAVO, one of the smaller Molucca islands, five miles S. of Machian. N. lat. $0^{\circ} 5'$. E. long. $127^{\circ} 24'$.

KAUOS, a town of Grand Bucharja; 65 miles N. of Samarcand.

KAUR, a town of Persia, in the province of Irak; six miles E. of Natens.

KAURABANG, a town of Candahar; 80 miles S.W. of Cabul.

KAURESTAN, a town of Persia, in Laristan; 65 miles E.S.E. of Lar.

KAURYS AOUL, a body of soldiers who form the last of the five corps of the king of Persia's guards.

They are in number two thousand, and are all horse, com-

manded by the constable, and in his absence by the captain of the watch. They keep watch in the night around the palace, serve to keep off the crowd when the soplhi goes on horseback, keep silence at the audience of ambassadors, seize the khans and other officers when disgraced, and cut off their heads when the soplhi commands it.

KAURZIM, in *Geography*, a town of Bohemia, and capital of a circle of the same name, on a river which runs into the Elbe; the circle supplies Prague and other places with timber; 24 miles E.S.E. of Prague. N. lat. $49^{\circ} 56'$. E. long. $15^{\circ} 5'$.

KAUSZAN, a town of Bessarabia, inhabited by Budziack Tartars; 12 miles S.S.E. of Bender.

KAUTEE, a town of Bengal; 14 miles E. of Toree.

KAUVERI, or **KAVERI**, in *Hindoo Mythology*, the faksi or consort of Kuvera, the deformed god of riches. The river in Mysore, in which is the island of Sri-rangapatana, or Seringapatam, usually written Caveri, is named after this goddess. See **KUVERA**, and **CAVERY**.

KAWAH, in *Geography*, a town of Hindoostan; in the circle of Ellichpour; 20 miles E. of Omrauty.

KAWAR, or **KUAR**, a country of Africa, lying to the northward of Kuku and Bornou, and extending eastward to Al W'ehat. It is bounded on the N. by that extensive desert which separates Egypt from Fezzan, and which is the proper desert of Libya; on the E. by Egypt, and on the W. by the desert of Bilmah.

KAWOMURAH, a town of Japan, in the island of Niphon; 100 miles N.W. of Meaco.

KAWTAH, a town of Hindoostan, in the circle of Singboom; 45 miles E. of Doefa.

KAWUCK, or **KHAWICK**, the furthest, or most eastern, of the passes leading through Hindoo-Kho into the province of Cabul.

KAWUTZA, a town of Sweden, in the government of Abo; 25 miles S.E. of Biorneborg.

KAXHERTA, a town of Sweden, in the government of Abo, on an island in the gulf of Finland; five miles S. of Abo.

KAY, **KEY**, or **Quay**, a wharf or place by the water-side, in a sea-port, for the loading and unloading of merchandize.

The verb *cajore*, in old writers, according to Scaliger, signifies to *keep in* or *restrain*; and hence came our term *kay*; the ground where keys are made being bound in with planks and posts.

The lawful keys and wharfs for the lading or landing of goods, belonging to the port of London are the following: viz. Chester's Key, Brewer's Key, Galley Key, Wool Dock, Custom-house Key, Bear Key, Porter's Key, Sab's Key, Wiggan's Key, Young's Key, Ralph's Key, Dice Key, Smart's Key, Somer's Key, Hammond's Key, Lyon's Key, Botolph Wharf, Graunt's Key, Cock's Key, and Fresh Wharf; besides Billingsgate, for landing fish and fruit; and Bridgehouse in Southwark, for corn and other provisions; but for no other goods or merchandize. Deal-boards, masts, and timber, may be landed at any place between Limehouse and Westminster; the owner first paying or compounding for the customs, and declaring at what place he will land them.

KAYA, in *Geography*, a town of Cacongo. S. lat. $5^{\circ} 20'$. E. long. $12^{\circ} 10'$.

KAYADERE, a town of Asiatic Turkey, near the W. coast of Natolia; five miles E.N.E. of Vourla.

KAYAGE, the money, or toll, paid for loading or unloading wares at kays.

KAYANG, in *Geography*, a river of the island of Celebes, which

which runs into Boni bay. S. lat. $4^{\circ} 59'$. E. long. $120^{\circ} 40'$.

KAYCOON POINT, a cape on the W. coast of the island of Celebes. S. lat. $3^{\circ} 22'$. E. long. $129^{\circ} 50'$.

KAYDANOW, a town of Lithuania, in the palatinate of Minsk; 16 miles S.S.W. of Minsk.

KAYE, a town of Africa, in the kingdom of Loango; 10 miles N.W. of Loango.

KAYE'S *Island*, an island in the N. Pacific ocean, near the W. coast of North America, discovered by Capt. Cook in his third voyage, May 1778, and thus named in honour of Dr. Kaye, late dean of Lincoln. It is 11 or 12 leagues in length, in the direction of N.E. and S.W.; but its breadth is not above a league, or a league and a half, in any part of it. The S.W. point, which lies in lat. $59^{\circ} 49'$, and long. $216^{\circ} 58'$, is a naked rock, considerably elevated above the land within it. Towards the sea, the island terminates in bare sloping cliffs, with a beach, a few paces wide, of large pebble stones, intermixed here and there with a brownish clayey sand. Parts of the shore are interrupted by small vallies and gullies; in each of which a torrent rushes down with violence, which is furnished by the melted snow. These vallies are filled with pine-trees, extending from the entrance to about the middle part of the island. This island is covered with a broad girdle of wood, spread upon its side, included between the top of the clifly shore, and the higher parts in the centre. The trees are of diminutive size. About the wood were observed a crow, and white headed and white breasted eagles; and fowls of various kinds were seen upon the water and near the shore. No animals were seen except a fox; nor were perceived any signs of inhabitants ever having been upon the island. Cooke's Third Voyage, vol. ii.

KAYEE, a town of Africa, in Kajaaga, on the Senegal. N. lat. $14^{\circ} 30'$. W. long. $9^{\circ} 35'$.

KAYKIYA, in *Hindoo Mythological History*, is one of the three wives of Dasarath, the father of Rama-chandra. About the period of the birth of the latter hero, Kaykiya, or Kahikeya, produced Lucins, his half brother, to assist him in the wars of Lanka or Ceylon, as detailed at great length in *Ramayana*, which see.

KAYMEN, in *Geography*, a town of Prussia, in the province of Samland; 12 miles E.N.E. of Konigsberg.

KAYMOURA, a town of Africa, in Bondou; 15 miles S.S.W. of Fatteconda.

KAYNS, a race of mountaineers in the Birman empire, perfectly distinct from the Cariaus, and speaking a language differing radically both from theirs and that of the Birmans. They were originally inhabitants of the Arracan mountains, whom the Birmans, since their conquest of that kingdom, have prevailed on, partly by force, and partly by mild treatment, to abandon their native hills, and settle on the plain. There are several small societies of these people established near the foot of the mountains further north. The Carianers are not to be found higher up than the city of Prune.

KAYOO, a town of Africa, in Bambarra, on the Niger. N. lat. 13° . W. long. $4^{\circ} 59'$.

KAYOR, or CAYOR, a kingdom of Africa, near the sea-coast, between the rivers Gambia and Senegal.

KAYSERSWERT, a town of Germany, on the E. side of the Rhine, once fortified, but now without walls; for a long time annexed to the bishopric of Cologne, but in the year 1762, restored to the elector palatine; 24 miles N. of Juliers. N. lat. $51^{\circ} 16'$. E. long. $6^{\circ} 37'$.

KAYUWAH, a town of Pegu, on the left bank of the Ava; 15 miles S. of Prome.

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KAYZEVAN, a town of Turkish Armenia; 69 miles S.W. of Erivan.

KAZAKOVA, a town of Russia, in the government of Irkutsk; 12 miles W. of Nertchinsk.

KAZAN, a city of Russia, and capital of a government of the same name, situated on the Volga. In the Turkish and Tartarian languages, kazan signified a cauldron large enough to contain victuals for many persons; and hence the name has been given by the Crim and Budziak Murfes to the families of their subjects or vassals, reckoning about 10 men to a kazan. This city consists of a strong fort, built with stone; the wooden town, as it is called; and several adjoining fubodes, or suburbs; and among them is one inhabited by Tartars, in which are four methods. Here are also several churches built with stone, and 11 convents in and near the town. The governor of the fort has the command of the garrisons and regiments; the garrison of the city consists of three regiments, for which a good hospital is provided. Kazan is also an archbishop's see. Here are also a manufacture of cloth, and a school, in which are taught the Russian and Latin languages, the principles of the Christian religion, and the elements of philology, in order to qualify preachers for the conversion of the nations to which they belong. This city was totally destroyed by fire in the years 1749 and 1752. Kazan was once the capital of a principal part of Tartary, and the seat of government, where the royal family resided. The Russians first made themselves masters of this important place on the 3d of October 1552; 400 miles E. of Moscow. N. lat. $53^{\circ} 45'$. E. long. $49^{\circ} 3'$.

This khanate (see KAPTSCHAK) subsisted as a peculiar state till the year above-mentioned, 1552, when it was conquered by czar Ivan II., and incorporated for ever with the Russian empire. The city of Kazan had been built in the year 1257 by a son of Banty, nephew of Tschingis-khan; and this khanate asserted its independency about the same time (1441) when the Krim disjoined itself from Kaptshak. The present Kazan Tartars are but a feeble remnant of what they were, partly consisting of those who remained in their old seats, and partly such as settled as fugitives, in other districts of Russia. They principally dwell at present in the governments of Kazan, Simbirske, Riefan, Viatka, Perme and Ufa (particularly in the Orenburg district of that government); their number is upon the whole considerable, but in no degree proportionate to the idea we form of their ancient population, from historical accounts; for, as far as we are able to conclude from particular statements, they cannot amount to much above 100,000. These Tartars form the root of the native of Russia; being not only unmingled, but also of a superior civilization to most of the remaining branches of their brethren. Tooke.

KAZANOW, a town of Poland, in the palatinate of Sandomirz; 40 miles N.N.W. of Sandomirz.

KAZANSKAIA, a town of Russia, in the country of the Cossacks, on the Don; 100 miles S.S.E. of Veronetz.

KAZANSKOE, or *Government of KAZAN*, a government of Russia, bounded on the N. and N.E. by Viatskoe, on the E. by Uphimskoe, on the S. by Simbirske, and on the W. by Niznei-Gorodskoe; about 100 miles in length, and from 100 to 110 broad; the capital is Kazan.

KAZARON, a town of Persia, in the province of Farsistan; 55 miles W.S.W. of Schiras. N. lat. $29^{\circ} 44'$. E. long. $51^{\circ} 28'$.

KAZIKIRAN, a town of Persia, in the province of Adirbeitzan; 45 miles S.E. of Urmia.

KAZIMERS. See CASIMIR.

KEA, a town of Africa, in the kingdom of Bambarra; 65 miles N.E. of Sego.

KEADUE, a post-town of the county of Roscommon, province of Connaught, Ireland; 85 miles from Dublin.

KEADY, a market and post-town of the county of Armagh, province of Ulster, Ireland, situated on the river Callan, along the banks of which, from Armagh to this place, are many considerable bleach greens, the linen manufacture being carried on here very extensively. Keady is 50 miles N. from Dublin; and six S. from Armagh.

KEAJA, or **KIAHA**, is the name of the lieutenant of the chief officers of the Porte, or the superintendent of their particular court.

KEALE, small fragments resembling chips or broken pieces of stone of various kinds; some of lime-stone, others of free-stone, and others of rag-stone, found mixed among the earth, of the upper stratum in many parts of this kingdom, and giving that soil the name of kealy; hence, some of these pieces of keale are thin and flat like bits of slate.

KEALY SOIL, in *Agriculture*, is used by the husbandmen for a sort of land, plentifully strewed with keale or kelp.

KEANPAN HEAD, in *Geography*, a cape on the E. coast of the island of Lewis, forming the N.E. point of the peninsula of Aird. N. lat. 58° 15'. W. long. 6° 5'.

KEANGON, a town of Grand Bucharia; 75 miles N.W. of Anderab.

KEARAH, a town of Hindoostan, in Bahar; 30 miles S.S.W. of Patna.

KEATE, GEORGE, in *Biography*, an entertaining and miscellaneous writer, was born at Trowbridge, in Wiltshire, in the year 1729. Having been educated at Kingdon, he repaired to Geneva, where he resided some years, and contracted an intimacy with Voltaire. He made the tour of Europe, and returning to his native country, entered himself as student in the Inner Temple, and was in due time called to the bar, and sometimes attended the courts in Westminster Hall, though he did not practise, either on account of his want of encouragement, or for want of a degree of application sufficient to make himself master of his profession. His first literary performance was entitled, "Ancient and Modern Rome," a poem written at Rome in the year 1755. It was published in 1760, and was very well received by the public: he next produced "A short Account of the Ancient History, present Government, and Laws of the Republic of Geneva." In 1768 or 69, he published "Ferney," an epistle to Voltaire, in which he introduced a fine eulogium on Shakspeare, which procured for him the compliment, from the mayor and burgeses of Stratford, of a standish mounted with silver, made out of the mulberry-tree planted by that illustrious bard. In 1779, he published "Sketches from Nature, taken and coloured in a Journey to Margate," in two vols. 12mo. This, though an avowed imitation of Sterne's "Sentimental Journey," contains so many just strictures on life and manners, enlivened by strokes of genuine humour and delicacy of sentiment, as to have been extremely popular, and it was thought that Sterne never had so happy an imitator as Keate. In 1781, he collected his poetical works, and published them in two volumes, which he dedicated to Dr. Heberden. The last, and his best production, and that which did most credit to his genius and liberality, was the "Account of the Pelew Islands," which he drew up and published in 1788. This work is written with great elegance, and compiled with much care: it had a considerable sale, but the author drew it up from the most disinterested motives, and received no advantage from it whatever. He died in the year 1797, leaving

behind him several other publications besides those already noticed. Gentleman's and Monthly Magazines.

KEATING, GEOFFREY, an Irish historian, was a native of Tipperary, and flourished in the earlier part of the seventeenth century. He was educated with a view to the duties of the Roman Catholic church, and having received at a foreign university the degree of doctor of divinity, he returned to his native country, and became a celebrated preacher. Being well versed in the ancient Irish language, he collected the remains of the early history and antiquities of the island, and formed them into a regular narrative. This work he finished about the time of the accession of Charles I. to the throne: it commences from the first planting of Ireland, after the deluge, and goes on to the 17th year of king Henry II., giving an account of the lives and reigns of one hundred and seventy-four kings of the Milesian race. From the above circumstances, our readers will readily suppose that this work is little better than fiction. Indeed the advocates of the author allege in his defence, that he has given his extraordinary relations merely as fables, and not as true history. It remained in MS. in the original language, till it was translated into English by Dermot O'Connor, and published in London in 1723. A new edition was published in 1738, with plates of the arms of the principal Irish families. Keating died about the middle of the seventeenth century.

KEBAN, in *Geography*, a town of Asiatic Turkey, in the province of Diarbekir; 70 miles N. of Diarbekir.

KEBER, the name of a sect among the Persians, who, in general, are rich merchants. See **GABRES**.

KEBET, in *Geography*, a small island in the East Indian sea. S. lat. 7° 10'. E. long. 130° 40'.

KEBLA, or **KEBLAH**, called also *Kebleh*, *Kiblah*, and *Alkebla*, among the Mussulmen, denotes that point, or quarter, to which they turn themselves when they say their prayers.

Mahomet, at first, durst not propose any other kebla to his followers but the temple of Jerusalem, which was the kebla of the Jews and Christians. In the course of time, however, being willing to bring them off from any communication in matters of religion, with the Jews and Christians, he appointed them, in the Koran, to turn themselves, at prayer, towards the temple of Mecca: from which time they called those two temples the *keblatan*, or two keblas.

Ricaut adds, that it is not the temple of Mecca, properly speaking, that the Turks call kebla, but rather the large square tower in the middle of the amphitheatre of that temple.

The kebla of the Jews was the temple at Jerusalem; that of the Sabians, the meridian; and that of the Magians, the rising sun. To this the prophet Ezekiel refers chap. viii. 16.

KEBLA is also used for an altar; or rather a *niche*, as Ricaut calls it, which the Mahometans have in all their mosques, and which is placed very exactly on that side towards the temple of Mecca.

Hence also kebla comes to be used, metaphorically, for the object, or end proposed, in doing any thing.

Thus, the kebla of kings, is their crown and authority; that of men of business, is money; that of gluttons, good cheer, &c.

KEBLA-NOMA, or **KEBLEH-NOMA**, a name which the Turks and Persians give to a little pocket-compass, which they always carry with them, in order to place themselves the more exactly when they go to prayers.

KEBLE, JOSEPH, in *Biography*, son of Richard Keble, esq. a lawyer of reputation at Ipswich, was born in London in

in 1632, and studied at Jesus and All-Souls colleges in Oxford. He was admitted a barrister at Gray's Inn, and attended with the utmost assiduity at the king's bench for fifty years, though it is believed he never had a cause put into his hands, or was called to make a motion. He died suddenly in 1710, as he was stepping into a coach at Holborn-gate, being in his 78th year. His publications were numerous, and chiefly on legal subjects. He published, however, an essay on "Human Nature;" and another on "Human Actions." At his death, it is said, his manuscripts amounted to one hundred folios, and more than fifty quartos, all in his own hand-writing. *Biog. Brit.*

KEBLE'S Island, in *Geography*, an island in the Mergui Archipelago, about five miles long, and $1\frac{1}{2}$ broad. N. lat. $8^{\circ} 59'$.

KEBUCK HEAD, a cape on the E. coast of the island of Lewis. N. lat. $58^{\circ} 2'$. W. long. $6^{\circ} 19'$.

KECKERMAN, BARTHOLOMEW, in *Biography*, a Prussian divine, was born at Dantzic in the year 1571: here he received the elements of a learned education, and at the age of eighteen he was sent to the university of Wittenberg, and studied philosophy and divinity two years. From this seminary he went to the university of Leipzig, where he spent some time, and then removed to Heidelberg. At this place he took his degrees, and at length became a tutor in several branches of knowledge. The fame which he acquired, as professor of Hebrew, induced the senate of Dantzic, in the year 1597, to invite him to become co-rector of the celebrated academical institution in that city, an office which he thought proper to decline. Four years afterwards the invitation was renewed, and he accepted it. The professorship to which he devoted his talents was that of philosophy, and he proposed to lead students to its inmost recesses by a more compendious method than had been before adopted. According to his plan, they were to complete their course of studies in three years. In the execution of his method he drew up a great number of treatises on almost all subjects that could claim the attention of the young; but by studying, writing, and teaching, he ruined his health, and fell a sacrifice to his industry in the thirty-eighth year of his age. His works have been published in two volumes, folio.

KECKLE, on *Board a Ship*. When the cables gall in the hawse, or the bolt-ropes do so against the ship's quarter, the seamen wind some small ropes about them; and this is called *keckling*.

KEDAS, in *Geography*, a town of Bengal; 15 miles S.E. of Midnapour.—Also, a town of Syria, on the river Jermuk, anciently called *Gadara*; 56 miles N. of Jerusalem.

KEDE', or **QUADE**, a town of Africa, in the country of the Foulahs; 40 miles W. of Kayor.

KEDE-FARAH, a town of Asiatic Turkey, in the government of Sivas, on the Kizilermack; 30 miles W. of Samfoun.

KEDGE, or **KIDGE**. See *GEOROSIA* and *MACRAN*.

KEDGER, or **KEDGE-anchor**, in a *Ship*. See *ANCHOR*.

KEDGING, a sea-term used when a vessel is brought up or down a narrow river by the wind, though the tide be contrary to it.

To do this, the seamen set their fore-fail, foretop-fail, and mizen-fail, and let her drive with the tide, that they may flat her about. If she come too near the shore, they have a little anchor ready, called the *kedger*, or *kedge-anchor*, with a hawser fastened to it from the ship; and this they drop in the midst of the current, by which means they wind her head about; and this done, take up the anchor again.

KEDGOORA, in *Geography*, a town of Hindoostan, in Bundelcund; 30 miles N.N.E. of Callingar.

KEDGREZ, a town of Hindoostan; 34 miles N.E. of Benares.

KEDHAM, a town of Upper Guinea, situated on the river Scherbro; 200 miles from its mouth.

KEDOUS, a town of Asiatic Turkey, in Natolia; 32 miles W. of Kintaja.

KEDRELÆON, *CEDRELAION*, in the *Materia Medica of the Ancients*, an oil taken from the *pix cedri*, or pitch of the cedar-tree.

KEDRON, in *Geography*. See *CEDRON*.

KEEBLE, **JOHN**, in *Biography*, an eminent organist and harpsichord-master, who, in 1737, on Roscingleave being supereded at St. George's, Hanover-square, on account of the derangement of his intellects, was appointed officiating organist of that church, upon half the salary, during the life of his predecessor. See *ROSCINGRAVE*.

Mr. Keeble was the first performer on the organ at the opening of Ranelagh, and at the subscription concert established by Hickford at his room in Brewer's-street. (See *HICKFORD*.) He had likewise, to the end of his life, the best range of teaching of any master in London; and was so sure of pupils of rank and fashion, in the immediate vicinity of his own residence, in Prince's-street, Hanover-square, that he declined the attendance of any others.

This able and experienced master, besides his practical abilities, had a passion for theoretical studies, and spent his leisure hours, during many years, in the investigation of the music of the ancients, and the *Harmonica*, which see. He was supposed to die worth 30,000*l.* in 1786.

KEEFA, in *Geography*, a town of Africa, in Algiers; six miles N.E. of Tipfa.

KEEL, in *Botany*. See *CARINA*.

KEEL, the lowest piece of timber in a ship, placed in the bottom of her hull; one end thereof being let into the stern-post, and the other into the stem.

If we compare the carcase of a ship to the skeleton of the human body, the keel may be considered as the back-bone, and the timbers as the ribs. It, therefore, supports and unites the whole fabric, since the stem and stern-post, which are elevated on its ends, are, in some measure, a continuation of the keel, and serve to connect and inclose the extremities of the sides by transoms; as the keel forms and unites the bottom by timbers. The keel is generally composed of several thick pieces, placed lengthways, which, after being scarfed together, are bolted and clinched upon the upper side. When these pieces cannot be procured long enough to afford a sufficient depth to the keel, there is a strong thick piece of timber bolted to the bottom thereof, called the *false keel*.

When a ship has a deep keel, she is said to have a *rank keel*; and this serves to keep her from rolling.

KEEL is also a name given to a low flat-bottomed vessel, used in the river Tyne, to bring the coals down from Newcastle, and the adjacent parts, in order to load the colliers for transportation.

KEEL, upon an even, in *Sea Language*, denotes the position of a ship when her keel is parallel to the plane of the horizon, so that she is generally deep in the water at both ends.

KEEL-haling, or **Keel-raking**, is a punishment inflicted at sea, in the Dutch navy, on very great offenders, who are drawn underneath the very keel of the ship. See *DUCKING*.

KEEL-rope, a hair rope running between the keelson and the keel of a ship, to clear the limber-holes when they are choaked up with ballast, &c.

KEELAGE, *KILLAGIUM*, a privilege to demand money for the bottoms of ships resting in a port or harbour.

KEELERS. in the *Sea Language*, small subs to hold stuff to grave a ship's bottom.

KEELING, a name used in some English writers for the common cod-fish. See **ASELLUS**.

KEELSON is a keel withinside similar to that without, upon the floor timbers exactly over the keel of the same dimensions, but always oak, keeping their butts or scarfs clear of each other: thus the bottom of the ship becomes firmly united by bolts driven through every floor timber, from the upper side of the keelson to the under side of the keel.

KEEMA-KEDAN, in *Geography*, a cluster of small islands in the East Indian sea, near the W. coast of the island of Leyta. N. lat. $10^{\circ} 30'$. E. long. $124^{\circ} 36'$.

KEEMO, in *Natural History*, a large shell of the cockle-kind; probably, says Marsden (Hist. of Sumatra, p. 9.) the largest in the world. It is found in the bay of Tappanooly, in Sumatra, chiefly, and likewise in other parts of the East. These shells are taken in deep water, by thrusting a long bamboo between the valves as they lie open, and by the immediate closure which follows they are made fast. The largest, says Mr. Marsden, which I have seen, was about three to four feet over. The shell is perfectly white, and is worked up like ivory by the natives.

KEENDUEM, in *Geography*, a river which rises in Thibet, and runs into the Irrawaddy, 40 miles below Ava. This great river comes from the N.W. and divides the country of Cassay from that of Ava. It is navigable, as far as the Burman territory extends, for vessels of burthen. The entrance of the Keenduem is about a mile wide.

KEENE, EDMUND, in *Biography*, an English prelate, was born at Lynn, in Norfolk, of which place his father was alderman. He was educated at Caius college, Cambridge, and, in 1740, obtained the rectory of Stanhope, in the bishopric of Durham. In 1750, he was chosen master of St. Peter's college, and in a short time after he served the office of vice-chancellor, in which he promoted the regulations for improving the discipline of the university. In 1752, he was made bishop of Chester, where he continued eighteen years, when he was translated to Ely. He died in the year 1781. He had a brother who was several years ambassador at the court of Madrid. Gen. Biog. Dict.

KEENE, in *Geography*, a post-town of America, in New Hampshire, and one of the most flourishing in Cheshire county; incorporated in 1753, and containing, in 1800, 1645 inhabitants. It is 86 miles N.W. from Boston.

KEENEEBALOV, or **ST. PETER'S MOUNT**, a large mountain in the N. part of the island of Borneo, near which are a people called Oran, Idaen, and Maroots, who offer human sacrifices to their deity. It is said that they are acquainted with a subtle poison, in which they dip their small darts, and thus cause a wound which produces instant death.

KEEP, To, in *Sea Language*, is a term used on various occasions: as

To keep the land abroad, is, to keep within sight of land as much as possible. See **HOLD**.

To keep the luff, is to continue close to the wind, or to sail with a course inclined to the direction of the wind as much as possible, without deviating to leeward. This is also called *keeping the wind*. See **CLOSE-hauled** and **LOOF**.

To keep off, is to sail off, or keep at a distance from the shore. See **OFFING**.

KEEP, or Dungeon, the strong tower of an ancient castle, commonly placed on a high natural or artificial mount, into which the garrison retired when the castle itself was taken. The lake or cellar of such keep was generally used to confine prisoners in.

KEEPER of the Forest, otherwise called *chief warden of the forest*, is an officer who has the principal government of all things belonging to a royal forest, and the check of all the other officers.

The lord chief justice in eyre of the forest, when he thinks fit to hold his justice seat, sends out his general summons to the keeper forty days before, to warn all under-officers to appear before him, at a day assigned in the summons. See **JUSTICE of the forest**.

KEEPER of the Great-seal, is a lord by his office, and is styled *lord keeper of the great-seal*. He is one of the king's privy-council, through whose hands pass all charters, commissions, and grants of the king under the great-seal; without which seal, all such instruments, by law, are of no force: for the king is, in the interpretation of the law, a corporation, and passes nothing firmly but under the said seal; which is, as the public faith of the kingdom, in the highest esteem and reputation.

The lord keeper has the same place, authority, pre-eminence, jurisdiction, execution of laws, and all other customs, commodities, and advantages, as the lord chancellor of England has for the time being. Both these officers cannot properly subsist at the same time, since the statute of 5 Eliz. The lord chancellor, or lord keeper, is superior in point of precedence to every temporal lord.

KEEPER of the Privy-seal, is a lord by his office; through whose hands pass all charters signed by the king, before they come to the great seal, and some things which do not pass the great-seal at all. He is of the king's privy council, and was anciently called *clerk of the privy-seal*; yet reckoned in the number of the great officers of the realm. 12 Ric. II. c. 11. 27 Hen. VIII. c. 11.

KEEPER, Boat, in *Sea Language*, one of the rowers, who remains as a centinel in his turn, to take care of any boat and her contents, either when she lies by the shore, or alongside of the ship; or when she is towed astern of her.

KEEPER, The, in *Geography*, a high mountain in the county of Tipperary, province of Munster, Ireland, which forms a conspicuous object to a great extent of country. It is seven miles S.S.W. from Nenagh.

KEEPING, in *Painting*, is a technical term, which signifies the peculiar management of those parts of the art, colouring and chiaro-scuro, which produces the proper degree of relief in objects admitted into a composition; according to their relative positions in the imagined scene, and the degree of importance the artist attaches to them.

When he has chosen his subject, and arranged his figures, forms, and colours, his next task will be, to give each object its local situation, and to bring those forward in the picture which he intends should be most impressive on the beholder; or at least, so to manage the surrounding ones, that those which are principal in the subject and composition, should not fail of their effect. This may be effected either by shade or colour: either by throwing a shadow across the inferior objects, or tinting them with a colour less bright than that given to the others; and even, in very skilful hands, it may be done by the very reverse mode of practice to either of the above: but that is extremely difficult, and requires the knowledge and the hand of a great master in the art to execute it.

As the objects recede in the ground-plane of the picture, the hue of the atmosphere intermixing with their proper, or local colour, as it is termed, (though improperly so,) will assist in their keeping; i. e. will cause them to appear at their just distance from the front figures. Therefore there is less art required here, than in separating and rounding figures situated nearly in the same plane, and combining to-

gether in masses, wherein the great difficulty of keeping lies.

It will be seen by what has been said, that keeping is but another word for *effect* in its more confined sense, as it relates to the individual objects of a picture; it is, however, a component part of *effect* in its general and most extensive meaning; of which it forms the basis in conjunction with arrangement of forms and colours; which latter includes, in the painter's eye, lights and shades. See *EFFECT*, in *Painting*.

On keeping, relieve entirely depends; for if the lights, shadows, and half-tints be not kept in their exact relative proportions of depths, no rotundity can be effected; and without due opposition of light, shade and colours, no apparent separation of objects can take place.

Whatever kind of effect is intended, keeping must be called into action; since each object must have its own apparent, proper, and local projection; and no less its relative strength in regard to the general impression which the subject is calculated to produce.

So much has been said that applies to this article under the word *Effect*, that we forbear to enlarge further upon it, than just to state, that the Flemish school may be most advantageously studied with regard to it, in what relates to history, portraiture, and still life: and in landscape, we would add to Ruysdale and Hobbins, the more valuable name of Claude, as the painter who has produced the most exquisite productions in art for the quality we are now discussing.

KEEPI THEJA, in *Botany*, the name by which some authors call the trees, on the branches of which the gum lacca of the shops is usually found.

KEERA, in *Geography*, a town of Hindoostan, in Bog-gilcund; 12 miles E. of Kewah.

KEERETPOUR, a town of Hindoostan, in the circar of Sumbul; 10 miles S.S.W. of Nijibabad.

KEERPOU, a town of Hindoostan, in Bengal; 33 miles S.S.W. of Burdwan. N. lat. $22^{\circ} 45'$. E. long. $87^{\circ} 35'$.

KEERYSHUR, a town of Hindoostan, in the Carnatic; 22 miles S.S.W. of Bomrauzepollam.

KEESERA, a town of Hindoostan, in the circar of Condapilly; 16 miles N.W. of Condapilly.

KEEVE, in *Rural Economy*, a provincial term used to signify a vat in which beer is worked or fermented.

KEEVE is also a vessel used in dressing tin-ores. See *TIN*.

KEFF, or KEFTS, in *Geography*, a town of Africa, in the kingdom of Tunis, reckoned the third for riches and strength in the country: anciently called "Sieca," or "Sieca Veneria." In the 18th century the citadel was blown up, and afterwards rebuilt with additional strength and beauty. In levelling an adjacent mount on this occasion an entire statue of Venus was dug up, which was instantly broken to pieces by the Moors. At the same time was dug up an equestrian statue, dedicated to Marcus Antoninus Rufus, which suffered the same fate. Keff, as its name imports, is situated upon the declivity of a hill, with a plentiful source of water near the centre of it; 70 miles W.S.W. of Tunis. N. lat. $36^{\circ} 15'$. E. long. 9° .

KEFFEKIL, in *Mineralogy*, a stone of a white or yellow colour, soapy feel, and moderate hardness, which increases in the fire. It is the substance of which the large Turkey pipes are made. It is found in Krim Tartary, in Canada, in Flanders, and in other places. The Tartars use it instead of soap, and it is so used in Austrian Flanders. Wiegand found it to consist of equal parts of magnesia and silic, whence it seems to operate as a fuller's earth. See *MEERSCHAUM*.

KEFFING, in *Geography*, a small island in the East Indian sea, near the S.E. coast of the island of Ceram. S. lat. $3^{\circ} 28'$. E. long. $131^{\circ} 11'$.

KEFIL, a village of the Arabian Irak, famous for the tomb of the prophet Ezekiel, annually visited by a multitude of Jews; 14 miles S. of Helleh.

KEFKEBEH, a town of Natolia; 20 miles N.E. of Eskishehr.

KEFKEN, a small island in the Black sea, near the coast of Natolia. N. lat. $41^{\circ} 6'$. E. long. $30^{\circ} 40'$.

KEFREEN, a town of Syria, on a large plain to which it gives name, distinguished for the number of pigeons that are bred there; 15 miles from Aleppo.

KEFT, or KEFIT. See *CORTOS*.

KEHEEP, a town of Hindoostan, in Lahore; 45 miles S. of Attock.

KEHEMEND, a town of Persia, in the province of Farshkan; 35 miles N. of Estakar.

KEHL, a fortress in the duchy of Baden. At the peace of Ryfwiek in 1697, this fort was ceded to the emperor and empress, and declared an imperial fortress. In the war between France and Austria, it was often taken and retaken; 2 miles E. of Strasburg. Kehl was united to the French empire by a decree of the Conservatory Senate in January 1808, and made a part of the department of the Lower Rhine.

KEHOA, a town of Asia, in Tonquin, near the coast. N. lat. $10^{\circ} 12'$. E. long. $105^{\circ} 21'$.

KEHRICZ, a town of Persia, in Khorasan; 70 miles N. of Herat.

KEIA-REGIAN, a town of Persia, in Irak; 60 miles W.N.W. of Hamadan.

KEIFLINGE, a town of Sweden, in the province of Schonen; 6 miles N.E. of Lund.

KEI-GAM, a town of Corea; 30 miles S.E. of Cou-fou.

KEIGHLEY, a town of England, in the county of York, situated on a navigable canal, and having a market on Wednesday. In 1801, the population consisted of 5745 persons, of whom 3456 were employed in trade and manufacture; 12 miles N. of Halifax, and 209 N.N.W. of London.

KEIKEM, in the *Materia Medica*, a name given by the Arabian writers to a gum used in their time for making of varnish.

Gum lacca is generally said to be the substance meant by it, but Avicenna seems to express by it every thing that was used as varnish. Thus he sometimes means by it the gum sandarach, and sometimes amber. The gum cancamum of the Greeks is also certainly often meant by it; but this is scarce to be mentioned as an application of the word, it being almost as general a term as itself, and standing with many of the old authors for sandarach, gum lac, and amber, as well as for the gum properly expressed by it. In short, all the gums used in making varnish, are in general called by the names of any one of them, and thus vernix, sandarach, cancamum, and lacca, are made synonymous words, and either stands for each of the things signified by all the words.

KEIKIS, in *Geography*, a town of Sweden, in the government of Abo; 48 miles N. of Biorneborg.

KEILAH. See *CEILA*.

KEILL, JOHN, in *Biography*, a celebrated mathematician and philosopher, was born at Edinburgh in the year 1671; here also he received his early education, and at the university pursued his maturer studies, and took his degree of M.A. He was particularly attached to Dr. Gregory, who

who taught the mathematics, and read a course of lectures on the Newtonian philosophy. Under him and by his aid he was enabled to make himself master of the "Principia," which he regarded as the ground-work of his future studies. In the year 1694, Mr. Keill went with his tutor to Oxford, entered himself of Baliol college, and read lectures himself in his own chambers upon natural and experimental philosophy, by which he acquired considerable reputation. As an author, he first appeared with an "Examination of Dr. Burnet's Theory of the Earth," which led to a more extended controversy on the subject: in this he displayed very commanding talents, and ably refuted the ingenious theories of Dr. Burnet and Mr. Whiston. He readily admitted that though the work, the errors of which he undertook to expose, was full of mistakes in philosophy, yet none ever abounded with more beautiful scenes and surprising images of nature. In 1700, he succeeded Dr. Millington, who was appointed physician in ordinary to the king, as Sedleian professor of natural philosophy, and read lectures in the public schools. He now removed to Christ-church college, and, in 1702, he published his treatise, intitled "Introductio ad veram Physicam," containing the substance of several lectures on the new philosophy. This work met with a favourable reception in his own and in foreign countries, and was considered as a good introduction to the Principia. In 1736, a new edition of it was printed in London at the wish of M. Maupertuis, who subjoined to it a new hypothesis of his own concerning the ring of the planet Saturn. In 1708, Mr. Keill was elected a member of the Royal Society, of which he proved himself a very useful member, and enriched the Transactions of the Society with many valuable papers. In the following year he made a voyage to New England, as treasurer of the Palatines who were sent by government into that country, and soon after his return, in the following year, he was chosen Savilian professor of astronomy. Mr. Keill next engaged in the controversy respecting sir Isaac Newton's claim to the invention of fluxions: several letters passed on the subject between M. Leibnitz and our author, till at length a special committee of the Royal Society was appointed to examine the merits of the case, which committee concluded their report with declaring, that they reckoned sir I. Newton the first inventor of the method in question, and that they were also of opinion that Mr. Keill, in asserting the same, had been no ways injurious to M. Leibnitz. The particulars of these proceedings may be found in a work to which we have, in this Cyclopaedia, already more than once referred, viz. the "Commercium Epistolicum" of Mr. Collins. The dispute was carried on for some years in the "Acta Eruditorum," and the "Journal Litteraire." It was generally admitted that Mr. Keill conducted himself in these contests with a great degree of firmness and spirit, and that he satisfactorily repelled the attacks upon the reputation of our illustrious countryman. In 1711, he published a paper in the Philosophical Transactions, "On the Rarity of Matter, &c." in which he points out various phenomena which cannot be explained upon the supposition of a plenum. About this time queen Anne was pleased to appoint him to the office of decypherer to her majesty, in which he continued till the year 1716. In 1713, the university of Oxford conferred upon him the diploma of doctor of medicine, and two years afterwards he published an edition of Euclid, to which he added two tracts on Trigonometry and the Nature of Logarithms. In the year 1718, Dr. Keill published at Oxford his "Introductio ad veram Astronomiam," which was afterwards translated by himself into English, at the request of the dukes of Chandos, under the title of "An Introduction to the true Astronomy," &c. The author did not long

survive this work. He died of a fever in the summer of 1721, being only in the 50th year of his age.

KEILL, JAMES, an eminent physician, was born in Scotland on the 27th of March 1673. Having received the early part of his education in his native country, he went abroad with the view of completing it in the schools of celebrity on the continent; and obtained such a degree of knowledge as distinguished him soon after his return to England. He had early applied to dissections, and pursued the study of anatomy, under Duverney, at Paris; whence he was enabled to give anatomical lectures, with great reputation, in both the English universities. He was honoured with the degree of M.D. by the university of Cambridge. In 1703 he settled at Northampton, and began the practice of his profession, in which he attained considerable fame and success. In 1706 he published a paper in the Philosophical Transactions, N^o 306, containing "an account of the death and dissection of John Bayles, of that town, reputed to have been 130 years old." The circumstances which he detailed very much resembled those that were observed by the celebrated Harvey in the dissection of old Parr. Dr. Keill, like his brother John, was well skilled in mathematical learning, which he applied to the explanation of the laws of the animal economy. His first publication was a compendium of anatomy, for the use of the pupils who attended his lectures, and was entitled, "The Anatomy of the Human Body abridged," 12mo. Lond. 1698, and was taken chiefly from Cowper: it went through many editions. In the year 1708, he gave the world a proof of his mathematical skill, in "An Account of Animal Secretion, the Quantity of Blood in the Human Body, and Muscular Motion," Lond. 8vo. This work was reprinted in 1717, with the addition of an essay, "concerning the Force of the Heart in driving the Blood through the whole Body," and under the title of "Essays on several Parts of the Animal Economy." He likewise published the same treatise in Latin, with the addition of a "Medicina Statica Britannica." The essay concerning the force of the heart drew him into a controversy with Dr. Jurin, which was carried on in several papers, printed in the Philosophical Transactions of the Royal Society, of which Dr. Keill had been elected a member; and was continued to the time of the death of the latter, which took place at Northampton, on the 15th of July 1619, in the vigour of his age. He had for some time laboured under a very painful disorder, viz. a cancer in the roof of his mouth, to which he had applied the cautery with his own hands, in order, if possible, to procure some relief, but in vain. Eloy. Dict. Hist. Hutchinson's Biog. Med.

KEILLESAY, in *Geography*, one of the smaller Western islands of Scotland; 3 miles N.E. of Barra island. N. lat. 57° 2'. W. long. 7° 23'.

KEIM-HOTUN, a town of Chinese Tartary, in the government of Kirin. N. lat. 44° 45'. E. long. 129° 24'.

KEIRAN, in the *Oriental Learning*, the Persian and Arabic name for the planet Saturn, according to Salmadras. See CHUN.

KEIRLEBERUS, JOHN GEORGE, in *Biography*, born at Würtemberg, was at once a philosopher, poet, and musician. In 1691, he composed for the birth-day of the emperor Joseph I. a Latin poem, which he set to music in a perpetual canon of 16 vocal parts, and 16 violin accompaniments, in a different melody; a piece of pedantry much admired by professors and deep dilettanti at the latter end of the 17th century. He afterwards composed another perpetual canon in eight parts, four viol da gambas, two counter-tenors, and two tenors, with several other various and complicated

complicated contrivances, as mystical, and as much respected at the time as the oracles delivered by the Pythia.

KEIS BAY, or *Sinclair's Bay*, in *Geography*, a bay on the E. coast of Scotland, in the county of Caithness. N. lat. $58^{\circ} 28'$ W. long. $2^{\circ} 58'$.

KEISER, REINHARD, in *Biography*, a German composer of the first class, for invention, ingenuity of accompaniments, and number of his works. This admirable musician was born in 1673, at Weissenfels in Saxony, and, very early in his professional career, appointed maestro di cappella to the duke of Mecklenburg. Though his first attempt at dramatic music was a pastoral, called "Ismena," for Wolfenbüttele, which he set in his 20th year, the year following he composed his opera of "Basilus," which was performed in the theatre at Hamburg with very great applause; and he continued writing for that stage till the year 1739.

He was educated at Leipzig, where he was entered of that university. He began to study music in that city, but was chiefly his own master, forming himself upon the Italian school, by studying the best productions of that country. His second opera for Hamburg, "Adonis," established him in the favour of that city for the rest of his life. According to Mattheson, whatever words he set on the subject of love, his music was peculiarly excellent. His operas, in Hamburg alone, amounted to 118. But besides his dramatic productions, he composed *divertimenti*, *serenades*, and *cantatas* innumerable. Indeed, this master was as sure of fancy and originality whenever he put pen to paper, as Haydn in his time. In a manuscript collection of near seventy cantatas by the greatest composers of his time, both of Italy and Germany, in which there are twelve by Keiser, in opening the book by chance, in any part of it where his cantatas are inserted, it is instantly known to be his music, at the first glance; so new are the passages, and so different the arrangement of the notes from that of his companions in this collection, amounting to near thirty of the first order. For grace and facility we do not recommend him: indeed, these excellencies were little known or sought during his time; but for modulation, ingenuity, and new ideas, he had scarcely his equal.

In a conversation with the elegant and judicious Haffé at Vienna in 1772, he assured us that, according to his conceptions, Keiser was one of the greatest musicians the world ever saw. His compositions, he said, were more voluminous than those of Alessandro Scarlatti; and his melodies, though then 70 years old, were still, he thought, modern and graceful. Adding, that this had been always his opinion; and he was not likely to be prejudiced in his favour, as Keiser was not his relation, his master, or even his acquaintance; but having lately looked at some of his works, he was astonished to see so much more elegance, clearness, and pleasing melody than are to be found in the productions of most modern masters, even now. "He composed, indeed, chiefly for Hamburg," Signior Haffé observed, "and, in general, to the German language, not being very well versed in that of Italy; so that he often blundered in setting Italian words; but he had always merit of other kinds to compensate for this defect."

At this time all our own knowledge of this composer was traditional, as we were then totally unacquainted with his works; but we can now speak from demonstration, and our own examination of his works of various kinds, which manifest all the vigour of a fertile invention, and correctness of study and experience.

KEISER'S RIVER, in *Geography*, a river of Africa, at

the Cape of Good Hope, which descends from Table mountain.

KEISKAMMA, a river of Africa, which runs into the Indian sea, S. lat. $32^{\circ} 4'$.

KEITH, JAMES, in *Biography*, a distinguished general, younger son of George Keith, earl marshal of Scotland, by a daughter of Drummond, duke of Perth, was born in 1696, and educated at the college of Aberdeen. He was an adherent to the Stuart family, and engaged in their defence in the year 1715; but on the defeat of his party he was glad to escape to France, where he applied to all the branches of knowledge useful in the military profession. He was admitted a member of the Academy of Sciences on account of his great proficiency in mathematics. He travelled through many countries in Europe, served 10 years in the Irish brigades in Spain, and afterwards entered into the Russian service, in which he was raised to the rank of brigadier-general. In the war between the Russians and the Turks he gave the most signal displays of courage and heroism, and was himself the first to mount the breach at the capture of Otchakof. He had a share in the war in Finland, between the Swedes and Russians, and was instrumental in placing the princess Elizabeth on the throne of Russia. At the peace of Abo in 1743, he was sent ambassador to the court of Stockholm, and on his return to Petersburg he was honoured with the marshal's staff; but as the emoluments of this office were insufficient for his support, he accepted an invitation from Frederick king of Prussia, by whom he was honoured with considerable appointments, and with his own personal friendship. In the war of 1756 he entered Saxony in the quality of field-marshal; and in 1758 he was killed, at the surprise of the camp of Hochkirchen, by count Daun. He was reckoned a very able general, and was highly estimable in his private character. The king of Prussia honoured his memory with a fine monument at Potsdam.

KEITH, in *Geography*, a parish in the county of Banff, Scotland, contains four hamlets or villages: 1st, the old town of Keith; 2d, the new town of Keith; 3d, the new town of New-Mill; and, 4th, the old town of New-Mill. The old town is nearly deserted by the inhabitants in consequence of the superior advantages of the new town. This was commenced in the year 1750, by the earl of Findlater, upon a barren moor, which was let in lots of 30 feet by 70. Here several manufacturers established themselves, and the place gradually increased in houses and population. In 1791 there were 1075 of the latter; and in 1800 the whole parish contained 749 houses, and 3284 inhabitants. These are comprised within an area of about six miles in length, by six in breadth. Flax-dressing, spinning, and weaving, are the chief branches of manufacture: a tannery, distillery, and bleaching-field, are included within the parish. The parish-school of Keith has been long noted for its able masters. Near old Keith, the river Isla, falling over some high rocks, forms a fine cascade, called the "Linn of Keith." James Ferguson, justly celebrated for his astronomical and philosophical writings, was a native of this parish. Within the precincts of the parish are some druidical remains. Sinclair's Statistical Account, vol. v. article written by the Rev. Alexander Humphrey.

KEKI, a town of Japan, in the island of Ximo; 15 miles N.N.W. of Naka.

KEKIO. See FERN-OL.

KEKO, in *Geography*, a town of Hungary, with a castle; 15 miles S.E. of Korpona.

KELA,

KELA, or QUILLA, a town of Africa, on the Slave coast, in the canton of Koto.

KELAIA, a town of Arabia, in the province of Hedsjas; 50 miles E.S.E. of Calaat el Moilah.

KELANG, or KILANG, a small island in the East Indian sea, near the W. coast of the island of Ceram. S. lat. $3^{\circ} 8'$. E. long. 128° .

KELAR, a town of Persia, in Irak; 70 miles E.S.E. of Casbin.

KELAT, a town of Persia, in the province of Khora-fan, at the edge of a mountain surrounded by rocks: it was taken by Timur Bec in 1382; 12 miles E. from Abi-vèrd.

KELES, a town of Asiatic Turkey, in Natolia; 28 miles E.N.E. of Ephesus.

KELHEIM, a town of Bavaria, situated on an island formed at the conflux of the Altmühl and Danube; 46 miles N.N.E. of Munich. N. lat. $48^{\circ} 52'$. E. long. $11^{\circ} 52'$.

KELIUB, or KALJUB, a town of Egypt, on the Ka-lit's Abu Meneggi, the capital of a district; 6 miles N. of Cairo.

KELL, in *Rural Economy*, a web, or kind of bag, in which insects are bred.

KELLAH, in *Geography*, a town of Abyssinia; 75 miles E. of Axum.

KELLER, JOHN BALTHASAR, in *Biography*, a celebrated artist, was born at Zurich in 1638. Having learnt the art of a goldsmith, in which he displayed great ingenuity, he went to Paris by the invitation of his brother, who held the posts of canon-founder, and commissary of artillery to the king of France. While in the French service he cast a great many cannon, together with several statues for the gardens of Versailles; but that by which he is chiefly celebrated is the grand equestrian statue of Lewis XIV. executed after the model of Girardon. He was made inspector of the foundry at the arsenal, and died at Paris in the year 1702. Gen. Biog.

KELLER, GODFREY, a native of Germany, who settled in England about the beginning of the last century, and had much practice as a harpsichord master. In 1711, he published, at Amsterdam, six sonatas, engraved on copper-plates; of which the three first were for two violins, a tenor, a trumpet or hautbois, and a bass; the three last for two flutes, two hautbois or violins, and a basso continuo. These the author dedicated to queen Anne. After this he and Finger published sonatas, jointly, in five parts.

As a composer, Keller was soon forgotten; but he was remembered a considerable time as the author of a posthumous treatise on *thorough-bass*, which he had finished, but did not live to publish. It was, however, printed, a short time after, by Cullen at the Buck, between the Temple gates and Fleet-street, with the following ample title: "A complete Method for the attaining to play a Thorough-Bass upon either Organ, Harpsichord, or Theorbo-Lute; by the late famous Mr. Godfrey Keller, with Variety of proper Lessons and Fugues, explaining the several Rules throughout the whole Work; and a Scale for tuning the Harpsichord or Spinnet, all taken from his own Copies, which he did design to print."

This treatise, though meagre, was the best our country could boast, till Lampe, in 1737, published his "Plain and Compendious Method of teaching Thorough-Bass, after a most rational Manner, with proper Rules for practice; the Examples and Lessons curiously engraved on Copper-plates." Of this work we shall speak hereafter. See **LAMPE**.

KELLERAMPT, in *Geography*, a bailiwick of Switzerland; in the canton of Zurich, of which Bremgarten is the principal place.

KELLEY, EDWARD, in *Biography*, the associate of Mr. Dee (to whose article the reader is referred), in his incantations, was born at Worcester in the year 1555. He was educated in grammar learning in his native city, and at the age of seventeen he was sent to the university of Oxford. According to Anthony Wood he left Oxford very abruptly, and in his peregrinations behaved so ill, and committed so many foul matters, that at Lancaster he was for some offence deprived of his ears. After this he became acquainted with Mr. Dee, and, as we have seen, they set out for the continent. For some time Kelley lived in a very expensive style, supported, probably, by the contributions which he levied on the credulous, till he was ordered into confinement by the emperor Rodolph. He obtained his release, and conciliated the favour of the prince, who conferred on him the honour of knighthood. Fresh discoveries of his knavery occasioned a second imprisonment, and in attempting to escape from the place of his confinement, he met with an accident which put an end to his life in the year 1595. He was author of several works, of which "A Poem on Chemistry," and another on "The Philosopher's Stone," were inserted in Ashmole's "Theatrum Chymicum Britannicum." He published at Hamburg, in 1676, a treatise, "De Lapide Philosophorum;" he was author, likewise, of "A True and faithful Relation of what passed, for many Years, between Dr. John Dee and some Spirits, &c." Several of his MSS. are still preserved in the Ashmolean Museum, at Oxford. Wood's Athen.

KELLEY, HUGH, a dramatic writer, was a native of Ireland, and bred a stay-maker, which profession he quitted when he came to London, and became writer to an attorney. He afterwards obtained a livelihood by his pen, and was author of the following pieces: "False Delicacy;" "A Word for the Wife;" "The School for Wives;" "The Romance of an Hour." These, as their titles denote, are all comedies. He was author also of "Clementina," a tragedy; "Thespis," a poem; "Memoirs of a Magdalen;" "The Babbler;" and a collection of Essays. He died in the year 1777.

KELLI, in *Geography*, a town and fortress of Hindoostan, in the country of Tanjore; 27 miles S. of Tanjore. N. lat. $10^{\circ} 20'$. E. long. $79^{\circ} 7'$.

KELLINORE, a town of Hindoostan, in the Carnatic; 10 miles N. of Pondicherry.

KELLS, a market and post-town of the county of Meath, province of Leinster, Ireland. It was in former times a city of note, and on the arrival of the English was walled and fortified with towers: a castle was built in 1178, and there were several religious houses. It was also a borough town, which, before the Union, sent two burgesses to parliament. Kells is 32 miles N.W. from Dublin on the river Blackwater, and nearly eight from Navan.

KELLY, EARL OF, in *Biography*, an illustrious dilettante musician, in whom were united application, genius, and a powerful hand on the violin. This nobleman went through all the gradations of study necessary to form a profound contrapuntist. When he quitted Great Britain to make the tour of Germany, according to Pinto, he could scarcely tune his violin; but stopping at Manheim, he heard the best instrumental music in Europe, and shut himself up with the elder Stamitz, whose originality and fire fet his young pupil in a blaze, and so congenial were the taste and disposition of the scholar and the master, that they seemed the growth of the same soil. The same energy and enthusiasm

enthusiasm which had lifted Stamitz above his fellows of the Mannheim school, stimulated the young earl to study composition, and practise the violin with such serious application, that, on his return to England, there was no part of theoretical or practical music in which he was not equally versed with the greatest professors of his time. Indeed, he had a strength of hand on the violin, and a genius for composition, with which few professors are gifted. His ear was so correct, and his perception so acute, that in the midst of a turbulent and tumultuous movement of a symphony in twelve or fourteen parts, if any instrument failed either in time or tune, though playing a different and difficult part himself, he instantly prompted the erroneous performer with his voice, by singing his part without abandoning his own.

KELLYSBURG, in *Geography*, a township of America, in Chittenden county, Vermont, at the head of the north branch of La Moille river.

KELMEE, a town of Hindoostan, in the Baglana country, on the coast; 16 miles N. of Bassien.

KELMEBEK, a town of Natolia; 28 miles E. of Pergamo.

KELMO, a town of Sweden, in East Gothland; 23 miles N. of Linköping.

KELNAR, a town of Caramania, near the coast of the Mediterranean; 12 miles W. of Selekeh.

KELNER, in *Biography*, a German musician, who came into England early in the last century, and performed on the double-bass in the theatres and concerts of the time. Having attached himself to Dr. Pepusch, his venerable countryman, it was found, at the doctor's decease, that the most curious books and MSS. of his valuable library at the Charter-house, were bequeathed to Kelner and Travers, another of the doctor's constant attendants, who both dying soon after their bequest was known, that, and the remainder of the most curious and inestimable musical library perhaps in Europe, were sold piece-meal, disposed of and embezzled, in a manner difficult to describe or understand. See **PEPUSCH**, and **Musical LIBRARY**.

KELP, in *Agriculture* a term applied to the mineral alkali in its more impure state; the kelp of commerce contains the ashes of the plant that affords it, and is found to be a good manure. See **CARBONAT of SODA**.

KELSAL'S ISLAND, in *Geography*, a small island in the Mergui Archipelago, separated from the S.E. extremity of the island of St. Sufanna, by Aldersey's straits. N. lat. 10° 27'.

KELSO, a town in the county of Roxburgh, Scotland, is built on a spot where the rivers Tevid and Tweed unite their streams, and is nearly surrounded with eminences covered with trees. Hence the scenery is particularly picturesque and pleasing. The houses are arranged round a large square, and on the sides of six streets, which diverge from the square in nearly a regular and uniform manner. The town-house, with shops and some of the principal dwellings, are in the square. In the town are the parish-church and an episcopal chapel, which are described as handsome structures. Among the public buildings are a dispensary, a public subscription library, and a modern bridge over the Tweed, erected in the place of a former one, swept away by a flood in 1798. A church was founded here in 1138; and a monastery was transferred from Selkirk to this place by David I., who "conferred on the monks this village, with its lands and waters, free from all exaction." David II. granted to the abbot a free-market here. "The town of Kelso shared the fate of the abbey during the hostile conflicts between the kindred nations in being often plundered and sometimes fired." In the years 1522, 1542, and 1544,

it was greatly damaged from the border warriors. The town was almost destroyed in 1686 by an accidental fire, and about the middle of the last century, it sustained great damage from the same cause.

David II. constituted the town of Kelso, with the barony of Bolden, and other lands, a free regality. This was converted, in 1607, into a lordship in favour of Robert Kerr, earl of Roxburgh. The duke of Roxburgh is proprietor of the lands here. The principal trade of Kelso is the manufacture of woollen cloth, and dressing of sheep and lambs' skins, of which it is supposed that from 70,000 to 80,000 are annually exported. Great numbers of boots and shoes are annually made here. This place is much resorted to by gentlemen who attend the "Caledonian hunt," and by others on account of the races. The abbey buildings of Kelso have been very extensive and grand. At present its ruined church presents many interesting fragments of Norman architecture. Mr. Pennant remarks, that the "environs of Kelso are very fine, and the inhabitants have much reason to boast of their prospects." In the vicinity of the town are several seats of the nobility and gentry: Fleurs, "the magnificent seat" of the duke of Roxburgh; Springwood-park, the residence of sir George Douglas, bart.; Softlaw-tower, Mr. Proctor's; Rose-bank, captain Scott's; Pinnacle-hill, Mr. Davidson's; Wooden, Mr. Walker's; &c. In 1800, Kelso contained 527 houses, and 4196 inhabitants. Chalmers's Caledonia, vol. ii. Sinclair's Statistical Account, vol. x. p. 576. Pennant's Tour to Scotland.

KELTAN, a town of Thibet; 40 miles E. N. E. of Lassa.

KELTANPUSUACLIAN, a town of Thibet; 52 miles W. of Sgigatche.

KELTSCH, a town of Moravia, in the circle of Pre-rau; 14 miles E. of Prerau.

KELVAN, a town of Persia, in Faristan; 18 miles E. N. E. of Schiras.

KELVEH, a town of Persia, in the province of Mccran, on the Nehenk; 280 miles S. E. of Zareng. N. lat. 28° 50'. E. long. 65° 48'.

KELVIN, a river of Ireland, in the county of Londonderry, which runs into the Roe, about 4½ miles S. from Newtown Limavaddy.

KELVIO, a town of Sweden, in the province of Ulea; nine miles E. N. E. of Gamla Karleby.

KELWAY, **JOSEPH**, in *Biography*, the best extempore performer on the organ, and neatest harpsichord player among the natives of our own country, during the middle of the last century. He had been, early in his life, apprenticed to a dancing-mall at Bath; but having attempted the harpsichord, and received a few lessons from old Chilcot, he had made such a progress on that instrument, that Geminiani, happening to hear him, discovered a hand and disposition so promising, that he not only encouraged him to study music as a profession, but gave him instructions. And his style of playing ever after more resembled the compositions of Geminiani than those of Handel, which all other organists fervently copied. The broken phrases and rhapsodical flights of Geminiani often seem more like voluntary playing than regular composition. Stanley's voluntaries were so smooth and well-phrased, that they seemed pieces played by memory; but Kelway's extempore playing, in the style of Geminiani, never had the air of studied pieces.

In removing from Bath to London, Kelway was soon noticed, and elected organist of St. Michael's, Cornhill, where he did not long remain; for on the death of Weldon, he resigned the organ at St. Michael's church to Mr., afterwards

wards Dr. Boyce; and was elected organist of the king's parish church, St. Martin's-in-the-Fields, where, of a Sunday afternoon, it was the custom, not only for young organists, but the principal professors, to crowd under the organ-loft to hear his voluntaries; in which there was an original and masterly wildness, which long supported his character as a great player, in a style totally different from other organists; bold, rapid, and fanciful.

With his harpsichord playing we were unacquainted; but we have often been assured, that he constantly kept in high practice, Scarlatti's best and most difficult lessons, which he executed in a manner peculiarly neat and delicate. As to composition, it is to be lamented that he did not exercise his pen and fancy more early in life, or that he ever attempted it at all: for on the arrival of Bach, and appointment at court as chamber-musician to the queen, to whom he dedicated his first publication in this country, Mr. Kelway thought it necessary, as music-master to her majesty, to publish a book of harpsichord lessons, which are, perhaps, the most crude, awkward, and unpleasant pieces of the kind that have ever been engraved. There is a manifest want of facility and experience, which proves, that though he was old in practical music, he was young in its theory and in composition.

Handel, who used to go frequently to St. Martin's church to hear him play, always, when indisposed, requested Kelway to play the organ for him in his oratorios.

This admirable performer, the most brilliant we ever heard, in point of fancy and finger, lived to a great age, but, unhappily, during the last years of his life, his intellects were somewhat deranged. He died in 1782, and was succeeded at St. Martin's church by Dr. Benjamin Cook, organist of Westminster Abbey.

KEMA, in *Geography*, a town on the E. coast of the island of Celebes. N. lat. $1^{\circ} 8'$. E. long. $125^{\circ} 2'$.

KEMA, in *Natural History*, a name given by Leo Africanus, and other writers of the African history, to a sort of subterranean production of the vegetable kind, greatly esteemed as a delicious food. The Arabian writers on medicine have often mentioned it, and that under names sufficiently resembling the modern African appellation, such as *camabe*, *camah*, *kemah*, and *camba*. They are not the roots of any plant, but a fine kind of subterraneous mushroom, or truffle, white on the outside, and which lie generally pretty deep in the earth.

KEMAOON, in *Geography*, a small state, which, with others, forms a tract of country separated from Hindoostan by lofty mountains, and situated to the N. of Oude and Rohilcund.

KEMAR, a town of Asiatic Turkey, in Natolia; eight miles S. of Sinob.

KEMBELA, a town of Sweden, in the government of Ulea; five miles S. of Ulea.

KEMBERG, a town of Saxony; six miles S. of Wittenberg.

KEMER, a town of Asiatic Turkey, in the government of Trebisond; 12 miles E.N.E. of Rizeh.

KEMGUR, a town of Hindoostan, in Bahar; 27 miles N.N.E. of Durbunga.

KEMI, a town of Russia, in the government of Olonetz, at the mouth of the river Kem, on the W. of the White sea. N. lat. $64^{\circ} 55'$. E. long. $28^{\circ} 38'$.—Also, a sea-port town of Sweden, in East Bothnia, situated on the right bank of the river Kemi, which runs into the gulf of Bothnia, about three miles from its mouth; 10 miles E. of Tornea. N. lat. $66^{\circ} 49'$. E. long. $24^{\circ} 27'$.

KEMIJAN, a town of Hindoostan, in Bahar; 31 miles S.S.W. of Patna.

KEMITRASK, a town of Sweden, in East Bothnia, at the N. extremity of a considerable lake formed in the river Kemi; 90 miles N.E. of Kemi. N. lat. $66^{\circ} 42'$. E. long. $27^{\circ} 14'$.

KEMLIK, or GHIO, a town of Asiatic Turkey, on the bay of the sea of Marmora; 20 miles W. of Isnik.

KEMMOO, a town of Africa, the metropolis of Kaarta; formerly large and populous, but destroyed since it was visited by Mr. Park. N. lat. $14^{\circ} 20'$. W. long. $7^{\circ} 46'$.

KEMNAT, a town of Bavaria; 26 miles N. of Amberg. N. lat. $49^{\circ} 53'$. E. long. $11^{\circ} 55'$.

KEMNITZ, a town of Silesia, in the principality of Jauer, on a river of the same name, which runs into the Bober; six miles W. of Hirschberg.

KEMPACH, a town of Tyrol; six miles N.W. of Schwaz.

KEMPEN, a town of France, in the department of the Roer, and chief place of a canton, in the district of Crevelt; 15 miles N.E. of Ruremond. The place contains 2870, and the canton 12,830 inhabitants, in 12 communes. It formerly contained a college and three convents, with some linen manufactures.—Also, a town of the duchy of Warsaw; 26 miles S. of Siradia.

KEMPFERA, in *Botany*, so named by Houstoun, in honour of Dr. Engelbert Kempfer, or rather Kämpfer, the celebrated traveller and naturalist. See VERBENA, and KEMPPER.

KEMPIS, THOMAS à, in *Biography*, was born in the year 1380, at a village in the diocese of Cologne, whence he derived his surname. The circumstances of his parents were such as led them to seek for him an education on a charitable foundation. At this place he was distinguished for his talents, piety, and attachment to a contemplative life. He entered the monastery of Mount St. Agnes, received the habit in 1406, and was ordained priest in 1423. He occasionally filled very important posts of his order, though it was much against his will that he engaged at all in the active duties of life. He died in 1471, at the advanced age of ninety-two. His works are chiefly devotional, and written in an animated style. The most complete edition of them is in three volumes, octavo, published at Antwerp in 1600, and in 1615. Many of them have been translated into a variety of languages, particularly that entitled "De Imitatione Christi," which is to be found in almost every known tongue in the world. The best English version is that by Dr. George Stanhope, which was printed in 1696, and has been several times reprinted. The learned are not agreed as to the real author of this celebrated work, though given to Thomas à Kempis by general consent, many have offered reasons why he cannot be the writer. The question was warmly agitated for sixty years, and gave rise to many curious discussions, an account of which is given by Dupin.

KEMPSVILLE, in *Geography*, a post-town of America, in Prince Ann county, Virginia; 243 miles from Washington.

KEMPTEN, a town of Bavaria, on the river Iler, lately Imperial. The burghers and magistracy profess Lutheranism, and in the town are a handsome parish church and a grammar school. In 1801, this town and its abbey were given to the elector of Bavaria; 36 miles S. of Augsburg. N. lat. $47^{\circ} 43'$. E. long. $10^{\circ} 17'$.—Also, a princely abbey, founded, or at least repaired and enriched, by Hildegard, wife of Charlemagne, in the 8th century. To this abbey belonged some towns and villages.

KEMSER, a town of Bengal; 15 miles S.S.E. of Curuckpour.

KEMSKOI, a town of Russia, in the government of Tobolsk. N. lat. $57^{\circ} 25'$. E. long. 92° .

KEN, THOMAS, in *Biography*, an English prelate, was born at Berkhamstead, in Hertfordshire, in the year 1637. He received his classical education at Winchester school, was elected scholar, and removed in due time to New-College, Oxford, of which he was chosen fellow. After taking his degrees he entered into holy orders, and became chaplain to lord Maynard, comptroller of the household to king Charles II. In 1666, he was chosen fellow of Winchester college, and in a short time afterwards was appointed domestic chaplain to Dr. Morley, bishop of Winchester, from whom he received a presentation to the rectory of Brixton, in the Isle of Wight, and afterwards, in 1669, to a prebend in the church of Winchester. About the year 1673, the same friend and patron gave him the rectory of Woodhey, in Hampshire, which, however, he soon resigned, conceiving that he ought to be satisfied with the emoluments which he had previously possessed. In 1675, he went, in company with his nephew, Mr. Isaac Walton, to Rome, and on his return he used to say he was grateful for the effect produced by the journey, inasmuch as he was more strongly confirmed in his belief of the excellence of the reformed religion, by witnessing the absurdities of the superstitious practised abroad. In 1679, he took his degree of doctor of divinity, and being appointed chaplain to the princess of Orange, he went to Holland. He discharged the duties of his office with so much prudence and zeal, as to secure the esteem and confidence of his royal mistress, but he incurred the temporary displeasure of her consort, afterwards William III. of England, by obliging one of his favourites to fulfil his engagement to a young lady of the princess's train, whom he had seduced under a promise of marriage. On his arrival in England he was appointed chaplain to lord Dartmouth, who received a commission to demolish the fortifications of Tangiers, and on his return from this expedition, he was immediately advanced to be chaplain to the king, by an express order from his majesty, who hoped thereby to render him subservient to his measures, and to the laxity of his morals. When the court removed to Winchester, the sovereign desired Dr. Ken to admit into his prebendal house Eleanor Gwyn, one of the king's mistresses, but he positively refused to submit to an arrangement which might appear to give countenance to vice; and Charles, so far from being offended with this decisive proof of religious intrepidity, took an early opportunity of raising him to the episcopal bench, by presenting him with the see of Bath and Wells. Within a few days of this appointment the king was attacked by his last illness, during which the bishop attended him in the most sedulous manner, endeavouring, though, it is said, ineffectually, to awaken the king's conscience to a sense of sorrow for his past profligate life. Nevertheless the bishop did not hesitate to pronounce absolution over his majesty without receiving any declaration of repentance, for which he has been deservedly censured; though it is to be feared, that almost all death-bed repentances, being the effect of dread of the future, can avail the supposed penitents very little with regard to a future state. The bishop was exemplary in performing the duties of his station, and was incessantly devising means for relieving the poor, and instructing the ignorant. With this view he built the first workhouse at Wells, which has proved the model for numbers that have been erected since his time; and he established many schools in all the great towns of his diocese. To these, and many other similar objects, Dr. Ken devoted the principal part of the

income of his see. He was a warm friend to the doctrine of passive obedience and non-resistance, and on that account was at first well received by James II., but when that prince endeavoured to introduce popery as the established religion of the country, he found it expedient to act upon more constitutional grounds, and to oppose the measures of the court with spirit and zeal. He was one of the seven bishops sent to the Tower for resisting that monarch's dispensing power, and for petitioning in behalf of their own and the people's rights. The bishop and his brethren, though charged with high treason, were honourably acquitted, to the inexpressible joy of every friend to the country. At the Revolution he refused to transfer his allegiance to the new sovereigns, and, declining to take the oaths required of him, was deprived of his bishopric. He now lived a life of retirement, but considered himself still as bishop in right, though not in fact, conceiving that no human power could separate him from the relationship which he bore to his diocese. Upon the death of his first successor, Dr. Kidder, he urged Dr. Hooper, who had been nominated to the vacant bishopric, to accept it, and ever afterwards signed himself "late bishop of Bath and Wells." From this time the queen settled on him a pension of 200*l.* per ann. which he enjoyed so long as he lived. He died, as he was on a journey to Bath, in March 1710-11, in the 74th year of his age. He had been in the habit of travelling many years with his shroud in his portmanteau, which he always put on when attacked by illness: of this he gave notice the day before his death, in order to prevent his body from being stripped. His works, which are all of a theological and practical turn, were collected, in 1721, in four volumes octavo. Biog. Brit.

KEN, in *Geography*, a town of Hindoostan, in the province of Behker; 20 miles N. of Behker.—Also, a small low island in the Persian gulf, in which are a few shrubs. N. lat. $27^{\circ} 54'$. E. long. $50^{\circ} 76'$.

KENAMOW, a town of Hindoostan, in Oude; 30 miles S.S.E. of Caunpour.

KENAPOOSSAN, a small island in the East Indian sea, in the Sooloo Archipelago. N. lat. $5^{\circ} 12'$. E. long. $120^{\circ} 23'$.

KENAREI-HAVAZ, a town of Hindoostan, in Moultan; 20 miles E. of Batnir.

KENAWAS, a town of Hindoostan, in the circle of Kitchwarah; 17 miles W. of Sheegur.

KENCHESTER. See ARICONIUM and HEREFORD.

KENDAL, or KENTDALE, a market town and parish in the ward of Kendal, and county of Westmoreland, England, is built in a pleasant valley on the western banks of the river Kent, over which there are three bridges. The town consists of one principal street running north and south, with several smaller ones branching off at right angles. Kendal has long been famed for its manufacture of cottons. In the year 1800, Houselman states that the town contained 12 manufactories engaged in this business, and that about 1200 pieces of cotton were made weekly, each of which contained about 24 pounds of wool. The business was then increasing. Eight houses were also engaged in the linsey manufactures, and "several other manufactures of less consequence are carried on. There are likewise a considerable number of persons employed in working and polishing marble, which, in the beauty and variety of its colours, is thought by many to be superior even to that imported from Greece and Italy. Mr. Wakefield manufactures large quantities of gunpowder at his mills a little below the town." The public buildings of Kendal are the church, a large and commodious workhouse, and a bridewell. Near the church is a handsome house called Abbot-hall, the property of sir Alan Chambre, one

of the judges of the court of common pleas. To the east of the town are the remains of a castle, which is supposed to have been built by the first barons of Kendal. It was formerly a place of considerable extent and strength; but its towers and walls are much mutilated and reduced. Parts of two square and two round towers, however, still remain, as well as great part of the wall round the outer ballium. Another object of antiquity is an artificial mount, called by the inhabitants Castle-law-hill. In the town are chapels for Quakers, Methodists, Presbyterians, and Roman Catholics. The chief manufacturers and tradesmen of the town are united into twelve companies, each of which has a hall: viz. Mercers, Tanners, Glovers, Sheermen, Cordwainers, Taylors, Pewterers, &c. Kendal is 22 miles from Lancaster, and 260 N. of London. In the year 1800 it contained 1424 houses, and 6892 inhabitants. Nicholson and Burn's History of Westmoreland, &c. two vols. 4to.; and Houselman's "Descriptive Tour through various Northern Counties," &c. 8vo. 1800.

KENDER, a town of Hindoostan, in Sehaunpour; 10 miles N. of Sehaunpour.—Also, a town of Curdistan; 28 miles S.W. of Betlis.

KENDRICK'S ISLAND, an island which forms the W. side of Nootka Sound, into which there is an entrance from the W. by Massachusetts Sound, along the northern side of the island.

KENDUSKEAG, a river of America, which runs into the Penobscot at the town of Bangor, about two miles below the head of the tide; where is a thriving village of handsome houses, and a place of the greatest trade in the river.

KENDY, a town of Bengal; 50 miles N.N.E. of Ramgur. N. lat. 24 16'. E. long. 85 6'.

KENE. See CANE and GHINNA.

KENEF, a town of Persia, in the province of Khorasan; 45 miles N. of Herat.

KENERA, or KENEREH, a mountain on the island of Salsette, near Bombay, celebrated for the number and extent of its excavations. Its principal cavern is arched, in the style of that described under the article KARLY; and was evidently, from its stile of sculpture, a temple of the god Budha, or Boodh. (See BOODH.) On each side of the vestibule are standing figures of the god, in easy attitudes, of tolerable proportions, and well sculptured in alto-relievo, fourteen feet high. This cave and three figures are elegantly represented in Daniel's fine series of oriental scenery. See KARLY.

KENFIG, or CYNFIG, a parish of Glamorganshire, South Wales, is noticed in this work, chiefly to correct the errors of other topographical writings; in most of which it is described as a town. Mr. Donovan, in his "Descriptive Excursions through South Wales," describes it as a poor, small village, inhabited mostly by failors and smugglers, and represents these as being particularly rude and insulting to strangers. A cluster of mean cottages, grouped together, with a church on a ridge of rising ground, constitute this village. In this parish is Kenfig-pool, a lake of fresh water, which "is embosomed in a depression of an irregular form, in the midst of sands that have been apparently drifted upon this spot from the contiguous coast, and though lying within a very short distance of the sea at flood tide, invariably retains its freshness pure and untainted by the muriatic properties of the former. The circumference of this pool is estimated at a mile and three quarters. The depth is great in some places. Indeed it has the reputation of being, in many parts, unfathomable." It is traditionally said, that a town formerly occupied this spot, and that it was swallowed

up by an earthquake. At a short distance from this lake, on an eminence, are some ruins, called Kenfig-castle, which was only a small fortress. In 1800, this parish contained 156 houses, and 655 inhabitants.

KENGHEVAR, a town of Persia, in Irak, on a river which runs into the Karasu; 240 miles N. of Isfahan. N. lat. 34 20'. E. long. 47 10'.

KENJAR, a town of Hindoostan, in Bahar; 30 miles S.W. of Patna.

KENILWORTH, a market town and parish in the hundred of Knightlow and county of Warwick, England, is famed in the annals of the kingdom for its ancient castle, "which," says Dugdale, "was the glory of all these parts, and for many respects may be ranked, in a third place at the least, with the most stately castles of England." This fortress was built by Geoffry de Clinton in the time of Henry I. He was chamberlain and treasurer to that monarch. By subsequent kings and occupiers it was greatly enlarged and strengthened at different times: and in the various civil and domestic wars of England, it was frequently the object of contention with different monarchs and nobles. To detail such particulars would be foreign to the nature of this work; but the reader may find much curious and interesting information relating to the same, in Dugdale's "Antiquities of Warwickshire." What remains of the buildings shew that the whole was an immense and spacious pile: consisting of an outer wall with bastion towers, a tilt-yard, with towers at each end; and several buildings within the ballium, or base-court. The area within the walls consists of seven acres. There were four gatehouses, and the walls were from ten to fifteen feet in thickness. At a short distance from the castle was a priory for Black canons. Of the buildings, parts of the gateway and chapel remain. Near these is the parish church, the western door-way of which is a curious specimen of ancient architecture. In the town are two meeting-houses, or chapels. Kenilworth is five miles from Warwick, and five from Coventry. In 1800, the town contained 418 houses, and 1968 inhabitants. Dugdale's Antiquities of Warwickshire.

KENKRI, a town of European Turkey, in Livadia; 40 miles W. of Athens.

KENKS, in the *Sea Phrase*, are doublings in a cable or rope, when it is handed in or out, so that it does not run smooth, or when any rope makes turns, and does not run smooth and clever in the block, they say it makes kenks.

KENMARE TOWN, called *Nedeen*, in *Geography*, a post-town of the county of Kerry, province of Munster, Ireland. It is situated at the north-east extremity of an extensive river or bay on the Atlantic ocean. Kenmare is 155 miles S.W. from Dublin, and 12 miles S. from Killarney.

KENMARE River, a river or arm of the Atlantic ocean, on the coast of Ireland, which extends about 20 miles in length, and about three in breadth, situated at the south-west side of the county of Kerry. It affords a safe and capacious harbour, but little frequented. The mouth is situated in N. lat. 51 40'. W. long. 9 57'.

KENNEBECK, a river of America, which, next to Penobscot, is the finest in Maine. Three miles from the mouth, the waters of the river are divided by Swan island, seven miles in length; on both sides of which they are navigable: at the distance of 38 miles from the sea is the island Nahunkag, signifying the land where eels are taken. Within three miles of this island, a small river, issuing from ponds in the town of Winthrop, runs into the Kennebeck, and it is known by the Indian name Cobbisconteag, denoting the place where sturgeons are taken. Six miles higher is the head of the navigable waters, which is a

basin

about four miles from the sea, and commodious for the anchorage of vessels. Where the navigation terminates stands Fort Wellern, erected in 1752. From this fort to Taconnet Fall is a distance of 18 miles. On the eastern side of the river near the fall is Fort Halifax, erected in 1754, situated on the point of land where the Sabastacook makes an addition of one-third to the size of the Kennebeck. Thirty miles above Halifax fort Sandy river flows into the Kennebeck; and about 40 miles higher, the Kennebeck takes a S.W. course; and 50 miles from Halifax fort it receives the eastern branch. The main branch of the Kennebeck, in its course through the wilderness, forms several carrying places or portages. At about 100 miles distance from the mouth of the eastern branch, the source of the main or western branch extends to a great distance along the side of the Chaudiere, which carries the waters from the highlands into the St. Lawrence. The eastern branch issues from a body of waters which lie N., about 20 miles from the confluence of the two branches. These waters are called Moose pond, or lake. The sides of the lake are very crooked, so that it forms an irregular figure, containing three times as much water as Lake George. To the N. and W. of the lake are high mountains, from which waters run by many channels to the St. Lawrence. The Kennebeck affords great quantities of lumber, and is inhabited, at different seasons, by several species of valuable fish; particularly salmon and sturgeon, shad, and alewives. This river forms the nearest sea-port for the people on the upper part of the river Connecticut. From the Upper Cohos, or Coos, on the latter river, to the tide water in Kennebeck, is a distance of 90 measured miles.—Kennebeck is also a county in the district of Maine, and the first inland county erected in this district. It was separated from the maritime county of Lincoln, by which it is bounded on the S., by Hancock county on the E., by Cumberland on the W., and by the Highlands on the N. It was incorporated in February 1799, and derives its name from the river, which, passing through it, divides it nearly in equal parts. It is about 40 miles wide and upwards of 100 miles long. The soil is better and more easily cultivated than that on the sea-coast. It contains 24,402 inhabitants.

KENNEBUNK, a river of Maine, having at its mouth a good harbour, whence great quantities of lumber are shipped. This river divides the townships of Wells and Arundel. After running a short course, it discharges itself into the sea between Capes Porpoise and Neddick.—Kennebunk is also the Indian name of the place, since called Wells, in Maine, about 33 miles below Portsmouth, in New Hampshire; in which is a post-office.

KENNEDY'S CREEK, a river of Kentucky, which runs into the Ohio, N. lat. $58^{\circ} 30'$. W. long. $83^{\circ} 36'$.

KENNEL, a term used indifferently for a puddle, a water-course in the streets, a house for a pack of hounds, and the pack or cry of hounds themselves.

Among sportsmen, a fox is said to *kenel*, when he lies close in his hole.

On a presumption that a kennel for hounds is to be erected, its site is thus described by Somerville:

“Upon some little eminence erect,
And fronting to the ruddy dawn; its courts
On either hand wide opening to receive
The sun's all cheering beams, when mild he shines
And gilds the mountain tops.”

However, this selection of a high situation is incompatible with a running brook; and as these two advantages cannot be united, water is to be preferred, with the aspect to

the morning sun as much attended to as possible. The number of its inmates must regulate the size of the kennel, and the architecture should be neat without being uselessly expensive. The most magnificent is the duke of Richmond's, at Goodwood, which cost 19,000*l.* and is sufficiently extensive for two packs of hounds. The building comprises five kennels; two 36 by 15, three 30 by 15, and two feeding rooms 20 by 15 feet, with stoves for warming the air when too cold. The huntsman and whipper-in have each a parlour, kitchen, and sleeping room. The kennel should be near the house, that it may be duly inspected; as cleanliness is no less essential than food. There should be room for two kennels under the same roof, for the convenience of keeping both clean, and for removing the hounds from one to the other, when they are washed. Besides, a second kennel will afford opportunity for drafting the hounds that are intended for hunting the next morning. Hounds will soon learn to answer to their names, and in drafting them, they may be easily counted into the hunting kennel. When the feeder first enters the kennel in the morning, he should let the hounds into the outer court; and the lodging room should be then thoroughly cleaned, the windows and doors opened, the litter well shaken, and the kennel be made sweet, before the hounds are again shut into it. The lodging room should be bricked, and sloped on both sides to the centre, and a gutter should be provided for carrying off the water, so that the floor, when washed, may be soon dried. It should be recollected, that nothing is more hurtful to hounds than damp, or more refreshing than warmth, after hard work. The kennel should have three doors, two in front and one behind; the latter having a lattice window in it with a wooden shutter, which is to be always kept closed, except in summer, when it should be left open during the whole of the day. The large centre window should have a folding shutter, which at night, according to the weather, may be wholly or partially closed, and thus the warmth of the kennel may be regulated according to circumstances, and as it may be judged necessary. The two great lodging rooms are exactly similar, and having a court be'onging to each, are distinct kennels, situated at the opposite ends of the building; in the centre are the boiling house and feeding yard; a lesser kennel, either for hounds that are drafted off, or those that are sick and lame, or for any other necessary purpose, is on each side; at the back of which, as it is but half the depth of the two larger kennels, are places for coals, &c. for the use of the kennel. There is also a small building in the rear for hot bitches. The inner court floors should be bricked or flagged, and sloped towards the centre, like those of the lodging rooms; and water brought in by a leaden pipe, should run through the channel in the middle. In the centre of each court is a well, large enough to dip a bucket to clean the kennel; to keep these from wanting repair, they should be faced with stone; to that of the feeding-yard a wooden cover should be fixed. The benches, which must be open to let the urine through, should have hinges and hooks in the wall, that they may fold up when the kennel is washed: they should be made as low as possible, that when a hound is tired, he may have no difficulty in jumping up, and at no time be able to creep under. A large brick court in front, having a grass court adjoining, and a brook running through the middle of it, completes the kennel. This court should be planted round, and also have lime and horn-chestnut trees near the centre for shade; some posts bound round with straw rubbed with galbanum, may be placed to prevent the hounds urining against the trees. The brook may be used as a cold bath for hounds lamed in the stifle, and strained. A high pale should inclose the whole, which, to the height

of four feet, should be close, the other open two inches wide. At the back of the kennel should be a thatched house, fenced up at the sides, to contain at least a load of straw; a pit for receiving the dung, and a gallows for the flesh. If a piece of ground adjoining the kennel can be inclosed for such dog-houses as may be brought alive, it will be very serviceable, as the disorders of condemned horses are not always to be discovered, and may be dangerous to others; the hounds may also be brought into this field to employ themselves after feeding; and the draft for the next day's hunting can here be more accurately made than when they are confined in the kennel. Stoves are used in some kennels; but a good feeder, and the mop properly applied, render them needless. Should ticks at any time be troublesome, the walls of the kennel should be well washed; and if they are not thus destroyed, the walls should be white-washed. When the hunting season is over, one kennel will suffice; the other, with the adjoining grass-yard, may be allotted to the young hounds. If there be convenience, the dogs should be kept separate from the bitches during the summer months. When hounds are very riotous, the feeder may sleep in a cot in the adjoining kennel, and if they be well chastised at the first quarrel, his voice will be sufficient afterwards. A feeder in Oxfordshire pulls a bell, the meaning of which he has taught the hounds to understand; and it silences them immediately, without his having the trouble to leave his bed. The farther removed a kennel is from a road or pathway, the quieter will it be. The interior regulations of a kennel comprehend the feeder, the sorts of food, and the mode of preparing and adapting it to the appetites of the hounds. A good feeder, young, active, industrious, and good-tempered, is essential. The exquisite sense of smelling peculiar to the hound, being that on which the sport principally depends, should be carefully preserved; and nothing so much contributes to this purpose as cleanliness. It is, therefore, of the greatest importance that the kennel should be kept clean and sweet. The heartiest and best food for hounds is oatmeal; which should be preserved in bins or sugar hogheads; for the older the meal is the better. The boiler should be of cast iron; and in size proportioned to the number of hounds in kennel. The flesh should be thoroughly boiled, and taken out of the broth with the strainer, before the oatmeal is put into it. After about three quarters of an hour's boiling, the liquor may be taken off and left to cool, which will soon become a strong jelly, and for hunting hounds it cannot be too compact. Five or six pecks of good old oatmeal will thicken a boiler of broth, sufficient for two feeds for 30 couple of hounds. The meat should never be given to the hounds too hot. The feeding troughs should be wide at bottom and have wooden covers; nor should they be made too long, as they are less convenient for being moved. After all, great attention to the time and mode of feeding will be required on the part of the kennel huntsman. He should be accustomed to call each hound by name, when he is fed; when a hound is called, he should approach the huntsman, and when he is touched with a stick, he should follow any where. By thus using hounds to their names, they will learn obedience. The day before hunting the hounds should be fed at eight in the morning, and three in the afternoon. Those that are to hunt the next day should be drafted into the feeding-yard, when about three buckets of thick mixed oatmeal is prepared for them; and the tender and bad feeders should have a handful of boiled flesh given to them afterwards. If hounds be low in condition, and have far to go to cover, they may all have a little thin lap again in the evening; but this should never be given, if you hunt early. Hounds should be sharp set before hunting, as in this state they run

the better. During the hunting season, hounds should have one pound of sulphur given them in their meat, and when the season is over, half a pound of antimony should be added to the sulphur and well mixed with the meat. Greens boiled in their meat, once a week, are likewise proper. A horse killed and given to hounds whilst warm, after a very hard day, is an excellent meal; but they should not hunt till the third day after it. The bones broken are good for poor hounds; sheep-trotters are very sweet food; and bullocks' paunches may also be of service, in the scarcity of horse-flesh. Immediately when hounds return from hunting, they should be fed; and if they have had a severe day, some hours after they should be fed again. By turning them out from the lodging-house to be fed, they will be refreshed, and stretch their limbs; and besides the litter being shaken up, and the kennel cleaned out, they settle themselves better on the benches afterwards. At all times after being fed, the hounds should be turned into the grass-court to empty themselves; as this practice will not a little contribute to the cleanliness of the kennel. Hounds should be shut up warm at night after hunting. Daniel's Rural Sports, vol. i. See HOUNDS and HUNTING.

KENNERY, in *Geography*, a small island near the coast of Malabar, surrounded with a wall and towers. N. lat. 18° 42'.

KENNET, a river of England, which rises near a village of the same name in Wiltshire, passes by Marlborough, Hungerford, and Newbury, whence it is made navigable to the Thames, which it joins a little below Reading. See CANAL.

KENNET, a township of America, in Chester county, Pennsylvania.

KENNETH II., in *Biography*, king of Scotland, succeeded his father Alpin in 823. He made war upon the Picts, and subdued their dominions in the north, which he divided among his soldiers. He translated the stone chair to Scone, where his successors were crowned, till it was removed by Edward I. He died in the year 854.

KENNETH III., son of Malcolm, subdued the Britons of Strathclyd, and was equally successful against the Danes, who had invaded his dominions, but attempting to alter the succession of his crown in favour of his family, he was assassinated in 994.

KENNETS, in our *Old Writers*, a sort of coarse Welsh cloth, mentioned in the stat. 33 Hen. VIII. c. 3.

KENNETS, in a *Ship*, are small pieces of timber, nailed to the inside of the ship, into which the tacks and sheets are belayed (as they call it), i. e. fastened.

KENNETT, WHITE, in *Biography*, a learned English prelate, son of the Rev. Basil Kennett, rector of Dimchurch, in Kent, was born at Dover in the year 1660. He received the early part of his education in the country, and made such progress in classical learning, that upon his being removed to Westminster, he was admitted into the upper school. Immediately after his admission he fell sick of the small-pox, which obliged him to wait another year before he could be received into the school. During this period he undertook the office of tutor to a gentleman's son in the neighbourhood. He entered himself at Oxford in 1678, and went through the studies and exercises of the place with great reputation. While he was an under-graduate, he was introduced to the acquaintance of Anthony Wood, and employed by him in collecting epitaphs, and other notices of eminent men, who had been members of Oxford. Mr. Kennett was particularly attached to the several branches of polite literature, connected with antiquities and history. But his career as an author commenced in the publication of a political tract while he was under-graduate, entitled "A Letter from a Student at Oxford

Oxford to a Friend in the Country concerning the approaching Parliament, in Vindication of his Majesty, the Church of England, and the University." It was written in defence of court measures, and supported principles which he renounced in his maturer years. The Whig party in parliament were so much offended with it, that enquiries were made after the author, in order to get him punished, but the sudden dissolution of parliament preserved him from the effects of their resentment. Mr. Kennett took his degree of B.A. in 1682, and in the following year he published an English translation of Erasmus's "*Moriæ Encomium*;" entitled "*Wit against Wisdom, or a Panegyric upon Folly*." He entered into holy orders about the year 1684, and in the following year he was presented to the vicarage of Amerfsden, in Oxford, by sir William Glynne, to whom he dedicated "*An Address of Thanks to a good Prince, presented in the Panegyric of Pliny upon Trajan, the best of Roman Emperors*." Mr. Kennett distinguished himself by preaching against Popery, though he did not engage in the famous Popish controversy. While he was out on a shooting party, he received a dangerous wound on his head, which obliged him to undergo the operation of trepanning: he, however, soon recovered, and was chosen lecturer at St. Martin's, Oxford: he was likewise chosen tutor and vice-principal at Edmund Hall, where he lived in terms of friendship with the principal Dr. John Mill, who was at this time employed in preparing for the press his celebrated edition of the New Testament. In 1693, he obtained the rectory of Shottefbrook, in Berkshire, and, in 1695, he commenced D.D., and in the following year was presented to the living of St. Boltolph, Aldgate, having been already appointed arch-deacon of Lincoln. In 1701 he engaged in a controversy on the rights of the convocation against Dr. Atterbury. In 1705, upon the advancement of Dr. Wake to the see of Lincoln, Dr. Kennett was appointed to preach his consecration sermon; which was published at the desire of the archbishops and bishops, and was greatly admired by lord chief justice Holt, who declared that it contained more to the purpose of the legal and Christian constitution of the church of England than any volume of discourses. In 1707 he was made dean of Peterborough, but he was growing very unpopular on account of his Whig principles and his opposition to Dr. Sacheverel: nevertheless, in the same year, he was allowed to exchange his living in Aldgate for the rectory of St. Mary Aldermary, in order that he might have more leisure for study and retirement. The zeal which dean Kennett displayed in opposition to the claims of the high church clergy, and the sentiments of moderation which he discovered towards the Dissenters, as well as his attachment to the Protestant succession, and the interests of civil liberty, rendered him very obnoxious to the Tories, who took every method in their power to expose him, one of which was devised by Dr. Wilton, rector of Whitechapel, who was afterwards deprived of his living as a nonjuror. This clergyman presenting a new altar-piece, representing the Last Supper, to his church, caused the figure intended for Judas Iscariot to be drawn as a likeness of the dean of Peterborough, with a black patch on his head, similar to one which Dr. Kennett wore on the wound which he had formerly received. It was soon known for whom the caricature was intended, and people came in crowds to see it. But by all moderate people of both parties, it was regarded as an insolent and profane prostitution of what was intended for the most sacred uses, and the bishop of London, without any interference on the part of the dean, ordered it to be taken down. After the accession of king George I., and when a rebellion was breaking out in Scotland, he preached with the utmost boldness in defence of the present settlement of the government of the

house of Hanover: he used to say, he was ready to live or die in defence of the glorious principles of the Revolution, and that he would go out to fight, when he could no longer preach in defence of them. He warmly opposed the proceedings in the convocation against Dr. Hoadly, bishop of Bangor, on whose side he was deeply engaged in the Bangorian controversy. His zeal in the cause of civil and religious liberty was, in the year 1718, rewarded by the bishopric of Peterborough, which he enjoyed ten years. He died in 1728, in the sixty-ninth year of his age. His principal works are, 1. "*The Life of William Somner*," which was prefixed to Mr. Bromie's edition of the famous antiquary's "*Treatise of the Roman Ports and Forts in Kent*." 2. A collection of English historians, under the title of "*The Complete History of England*," in three vols. folio, the last of which was written by himself. 3. "*Historical Account of Appropriations*." Bishop Kennett sustains a considerable rank in the episcopal order for learning and abilities. He was deeply read in English history and antiquities, though he was by no means deficient in that kind of knowledge which was the more immediate business of his profession. He was anxious to discharge the duties of his ministerial functions with credit to himself, and advantage to those who were the immediate subjects of his pastoral care; nor did the high rank to which he attained lead him to neglect the duties of a parish-priest. He was accessible and communicative, a true friend, as well as an admirable pattern to his clergy, and those of them who distinguished themselves either by their learning, or by a zealous discharge of their parochial duties, were sure of his respect and encouragement.

KENNETT, BASIL, younger brother of the above, was born at Postling, in Kent, in 1674, and educated at Corpus Christi college, Oxford. In 1696, he published "*Romæ Antiquæ Notitia, or the Antiquities of Rome*," a work that for a century was generally used in our classical schools. In the following year he gave to the public "*The Lives and Characters of the Ancient Greek Poets*;" and he was about the same time elected a fellow of his college, and entered into orders. He was author likewise of "*An Exposition of the Apostles' Creed, according to Bishop Pearson*," and "*An Essay towards a Paraphrase on the Psalms in Verse, with a Paraphrase on the third Chapter of Revelations*." In 1706, he was appointed chaplain to the English factory at Leghorn; in this office he conducted himself with so much prudence and propriety that he acquired universal esteem, even from the Catholics, who had used every effort to prevent his officiating in that capacity. In 1714, he returned to England, and commenced D.D., but died in a few months afterwards. A volume of his sermons, prepared for the press during his life, was published in the year 1715. *Biog. Brit.*

KENNICOTT, BENJAMIN, a learned English divine, and oriental scholar, was born at Totness, in Devonshire, in the year 1718. His father was master of a charity-school in that place, and the son succeeded to the employment at a very early age. While in this situation his talents were discovered, and a subscription entered into, in order to procure him the advantages of an academical education. He accordingly was entered of Wadham college, Oxford, where he soon distinguished himself in that department of study in which he afterwards became so eminent. He commenced his career as an author while he was an under-graduate, by publishing two dissertations; the first "*On the Tree of Life in Paradise, with some Observations on the Fall of Man*;" the second "*On the Oblation of Cain and Abel*." This work procured the author the extraordinary honour of having the degree of B.A. conferred on him by the university a year before.

before the statutable period; and likewise was the means of obtaining for him a fellowship of Exeter college. When he was of a sufficient standing, he took the degree of M.A. and about the same period he was admitted to holy orders. In the year 1753, he laid the foundation of his great work, by publishing "The State of the Hebrew Text of the Old Testament considered; a Dissertation in two Parts, &c." The design of this publication was to overthrow the strange notion which had long prevailed among divines concerning what is called the integrity of the Hebrew text; viz. that the copies of it had been preserved absolutely pure and uncorrupt. This notion had been thrown out and vindicated by Capellus, but though his arguments were supported by the authority of the Samaritan Pentateuch, that of parallel passages, and the ancient versions, yet as he had no opportunity of consulting MSS. he could never prove his point. This task was reserved for Mr. Kennicott. His dissertation proved that there were many Hebrew MSS. extant, which, though they had hitherto been generally supposed to agree with each other, and with the printed Hebrew text, yet contained numerous and important various readings, and that from these considerable authority was derived in support of the ancient versions. This work was examined with great severity, both at home and abroad: many excellent and learned Christians imagined that it was opening wide a door to infidelity, and that the cause of their holy religion would be much injured by it; but by the generality of learned and candid biblical scholars, both natives and foreigners, its value was justly appreciated, and they were led to form high expectations of the author's future labours in the service of sacred criticism. Mr. Kennicott spent the next three or four years principally in searching out and examining Hebrew MSS. In 1759, he was presented to the vicarage of Culham, in Oxfordshire, and in the following year he published his "State of the printed Hebrew Text of the Old Testament considered." In this volume he vindicated the authority and antiquity of the Samaritan copy of the Pentateuch;—proved that the present Chaldee paraphrase has not been taken from MSS. so very ancient as has been generally supposed, and that it has been, in some cases wilfully, altered in conformity to the Hebrew text, where that text itself had been corrupted;—appealed to the sentiments of the Jews themselves on the subject of the Hebrew text, and gave a history of it from the close of the Hebrew canon, down to the invention of printing, and presented an account of all the Hebrew MSS. then known, with a collation of eleven Samaritan MSS., and a particular catalogue of 110 Hebrew MSS. in Oxford, Cambridge, and the British Museum. Mr. Kennicott now published proposals for collating all the Hebrew MSS. prior to the invention of printing, that could be found in Great Britain and Ireland, and for procuring as many collations of foreign MSS. of note, as the time and money he should receive would permit. In this undertaking he was supported with the most liberal subscriptions from persons of all parties, and of the very highest ranks in society, and he bent his whole powers to complete the very arduous undertaking. While he was proceeding in the work he was appointed keeper of the Radcliffe library; admitted to the degree of doctor of divinity; presented to a living in Cornwall, and rewarded by a canonry of Christ-church, Oxford. In the year 1776, Dr. Kennicott published the first volume of his Hebrew bible, and in the year 1780 the second volume, which completed the design, made its appearance. To the whole was prefixed a general dissertation, giving a full history of the nature of the design, and of the benefits likely to result from it. The various readings which are inserted in it are the result of a collation of six hundred

MSS. Such a work, and so important to the best interests of mankind, reflects very high honour on the country in which it was first patronized and carried into execution. Within two years of his death, Dr. Kennicott resigned his living in Cornwall, from conscientious motives, on account of his not having a prospect of ever again being able to visit his parish. No one, however, capable of appreciating the doctor's labours, can doubt that they might properly have entitled him to retain this preferment; still a conduct, so signally disinterested, deserves to be recorded and celebrated. He died at Oxford on the 18th of September 1783, at the age of sixty-five. At the time of his death he was employed in preparing for the press "Remarks on select Passages in the Old Testament," which were published as a posthumous work, accompanied by eight sermons, partly critical and partly practical. In private life, Dr. Kennicott sustained the character of a liberal, worthy, and friendly man: in company he appeared unaffected, good tempered, and cheerful. *Encyc. Brit. Monthly Review, and New Ann. Register.* For a particular account of Dr. Kennicott's laudable undertaking, see the article *Hebrew BIBLES*.

KENNINGTON, in *Geography*, an extensive and populous hamlet, annexed to the parish of Lambeth, Surry, England. The manor formerly belonged to the duchy of Cornwall, and was provided with a palace, which was occasionally occupied by Edward the Black prince, and Henries IV., VI, and VII. On a common or open piece of ground the convicted felons of Surry were formerly executed: around this spot several rows of houses and streets have been recently built: and Kennington may now be considered as constituting a part of the British metropolis. *Lysons's Environs of London.*

KENNIS, in *Biography*, a performer on the violin, with an uncommon power of execution. See LOUVAIN and CARILLONS.

KENNOMICK, GREAT, in *Geography*, a navigable river of America, in the N.W. territory, which empties itself into the S. end of the lake Michigan, N. lat. 42° 14'. W. long. 86° 52'. The waters of this river communicate, by a portage of 30 yards, with Little Kennomick, a short river which runs north-easterly into this lake..

KENPOU, a river of Thibet, which runs into the Sampoo, in the kingdom of Ava.

KENRICK, WILLIAM, in *Biography*, the son of a citizen of London, was brought up to a mechanical employment, which he soon abandoned, and devoted himself to the cultivation of letters, by which he supported himself during the remainder of life. He was some time a student at Leyden, and, upon his return to England, he appeared as a poet, in "Epistles Philosophical and Moral." He wrote an avowed defence of infidelity while in prison for debt, and with a declaration, that he was less ambitious of the character of a poet than of a philosopher. He was for a considerable time a writer in the *Monthly Review*, but having a disagreement with Mr. Griffiths he began a new review of his own. He published, in a few days after the appearance of Dr. Johnson's edition of Shakspeare, a review of it, "in which the ignorance or inattention of that editor is exposed, and the poet defended from the persecution of his commentators, 1765." In the year 1766, he produced a comedy, entitled "Falstaff's Wedding," at first intended to have been given to the public as an original play of Shakspeare, retrieved from obscurity; and it was admitted to be a tolerably good imitation of the great master of drama. Mr. Kenrick was continually involved in disputes, many of which were not creditable to his character. He translated the *Emilius* and *Eloisa* of Rousseau, and *Millot's Elements of the History of England.*

England. He was likewise the author of several dramatic performances, and other miscellaneous pieces. He was, in 1774, the editor of "The Poetical Works of Mr. Robert Lloyd," in two vols. 8vo. He died in the month of June 1777. *Encyc. Brit.*

KENSINGTON, in *Geography*, a pleasant and populous village in the hundred of Olfulton, England, is about one mile and a half W. of Hyde-park Corner, and consisted, in 1800, of 1433 houses, which were occupied by 8556 inhabitants. This place is chiefly noted for its royal palace, which was first appropriated to the crown by king William III. who built a house here; but that and the gardens have been much altered and improved by succeeding monarchs. The gardens are of considerable extent, and are laid out in gravel walks, plantations, &c. This is a favourite place of resort and exercise for the inhabitants of London, particularly during the fine weather in summer. They are nearly four miles in circumference, and are separated, on the eastern side, from Hyde-park by a low wall. Through these gardens flows a small stream, which is made to fill a canal within the inclosure, and another much larger, called the Serpentine river, in Hyde-park. The palace is a large irregular edifice, built at various periods, without harmony of design or beauty of architecture. Its state rooms consist of a suit of 12 apartments, which contain several valuable and curious paintings by artists of eminence. The names of some of these are published in *Lysons's Environs of London*; and more fully in "The Ambulator," 12mo. 1810. Besides several elegant villas in this parish, is a fine ancient mansion called Holland House, the seat and property of lord Holland, for a view and account of which, see *Architectural Antiquities of Great Britain*, vol. ii.

KENSINGTON, a township of America, in Rockingham county, New Hampshire, about six miles S. of Exeter, and eight N. of Newbury port. It was incorporated in 1737, and contains 776 inhabitants.

KENT, a maritime county of England, forms the south-eastern extremity of this island, and is bounded on the west by Surry, on the north by the German ocean and the river Thames, which separates it from Essex, on the east by the Downs and the straits of Dover, and on the south by Sussex, and part of the same straits. The medium length of the district, thus encompassed, from east to west, is 66 miles, and its breadth about 26, whilst the circumference is nearly 174 miles. Its area, according to *Boys's Agricultural View*, is about 832,000 acres.

Kent is primarily divided into five large districts, called *Laths*, viz. Sutton at Hone, Aylesford, Scray, Shipway, and St. Augustine. These are subdivided into bailiwicks, hundreds, and liberties. The whole county contains fourteen bailiwicks, sixty-three hundreds, fifteen franchises or liberties, the two cities of Canterbury and Rochester, and thirty-four market towns, though in some of these the market is discontinued. The number of houses, according to the returns under the population act of 1800, amounted to 52,998; that of inhabitants to 307,624; of whom 151,374 were males, and 156,250 females. For local purposes, the county is nearly equally divided into East and West Kent, the former contains the laths of Sutton at Hone, Aylesford, and the southern part of Scray; the latter the northern part of the lath of Scray, and those of Shipway and St. Augustine. In each of these great districts, a court of session is held four times every year; twice originally and twice by adjournment: those for the eastern division at Canterbury, for the western at Maidstone. The justices, though appointed for the whole county, generally confine their attention to that district in which they reside. The county

town is Maidstone, where the assizes are held, and the knights of the shire are elected. Kent returns eighteen members to parliament; viz. two for the county, and two each for Canterbury, Rochester, Maidstone, Queenborough, Dover, Sandwich, Romney, and Hithe. The four last are reckoned among the Cinque Ports. The ecclesiastical jurisdiction is divided between the archbishopric of Canterbury and the bishopric of Rochester; the former having eleven deaneries, containing 281 parishes; the latter four deaneries, containing 132 parishes.

Ancient History.—This district is peculiarly interesting to the antiquary, not only from the numerous vestiges of castles, abbeys, and old churches still remaining, but from its proximity to the continent. Many authors contend, that it formerly joined the main land, by means of an isthmus; and adduce plausible arguments in support of such hypothesis. Strabo, Cæsar, Ptolemy, and some other ancient writers, call this district Cantium; which word the Saxons altered to Cant-gar-Cantd. In the Domesday Survey it is written Chenth. All the transactions relating to Cæsar's invasion of Britain occurred in this county; for on this coast he made two descents, the 1st, fifty-five years before the birth of Christ, and the 2d, in the following year. At this time Kent was governed by four British kings; who collected not only their own subjects, but a vast concourse of armed men from the neighbouring states, to oppose and repel the invading Romans. Their efforts and bravery were unavailing, and the foreign warriors ultimately compelled the Britons to pay an annual tribute. In the year A.D. 43, a third descent was made on this coast by Aulus Plautius, who, being afterwards joined by Claudius, effected a conquest over the Britons. Kent was now included in that division of Britain called Britannia-Prima; and was governed by Roman laws and Roman officers. Several permanent stations and temporary encampments were established in this county; and military roads were formed. Among the latter was the Watling street, which extended from Dover, Dubris, to London, Londinium. On its course were the other Roman stations of Durovernum, at Canterbury, Durolevum, Durobrivis, at Rochester, Vagniacæ and Noviomagus. Two other vicinal roads, at least, were formed in this county; one from Durovernum to Regulbium, or Reculver, and the other from the first place to Rutupium, or Richborough. Another road, called Stone-way, extended from Canterbury to Limne, the Roman Portus Lemanis.

The first descent of our Saxon ancestors was made in this county, A.D. 449, when Hengist and Horfa, with about 1500 men, landed at Ebbsfleet, in the Isle of Thanet. After some battles with the Picts and Scots, Hengist was invested with the sovereignty of Kent; but wishing to engross the whole island, he was involved in a war with the Britons, and several battles were fought within this county and on its confines. The Saxons, however, prevailed, and Kent continued a distinct kingdom for many reigns. In this county Christianity was first established in Britain. See *ST. AUGUSTINE*, and *Turner's History of the Anglo-Saxons*, 2 vols. 4to.

The present flourishing condition of Kent has partly originated from the peculiar custom by which the descent of landed property is here regulated, and which is comprehended under the term *gavel-kind*. The customs are of very remote date, and prevailed throughout England till the Norman conquest. It is evident that at that period the eldest son did not inherit to the exclusion of his brethren: the right of sole succession, in preference to the divisible practice of inheritance, was then introduced by the Conqueror, as a specimen of the arbitrary dominion he intended to establish. The men of Kent successfully resisted the encroachment, and retained their ancient customs: while the other parts of the

tation were gradually brought to acquiesce in the claim of primogeniture.

The law of gavel-kind comprehends the joint inheritance of all the sons to the estate of the father; and should the father survive his sons, the inheritance devolves to his grandsons, or to his daughters. The partibility of this custom is not restrained to the direct line of consanguinity; for all brothers may jointly inherit the estate of a deceased brother; and, agreeably to the same rule, nephews and nieces, by the right of representation, are, in their degrees, intitled to the same division of property. So predominant is gavel-kind in Kent, that all lands are presumed to be subject to that usage, till the contrary is proved; and formerly, such lands only were exempted from it, as were holden by knight's service. See GAVEL-KIND.

The general aspect of Kent is very beautiful; arising from the inequality of the surface, the diversity of the scenery, and the variety in the verdure. "The whole county," Mr. Hausted observes, "excepting the marshes and the Weald, is a general cluster of small hills; two chains of which, higher than the rest, run through the middle of Kent, from west to east, in general at about eight miles distance from each other, (though at some places much less,) and extending from Surrey to the sea." These are called the Upper and Lower Hills, and are mostly covered with coppice and woodlands. The northern range, and, indeed the whole north side of the county, is composed principally of chalk and flints, as well as a large tract on the eastern coast: the southern range is chiefly of iron-stone and rag stone: to the westward, clay and gravel prevail on the eminences.

Mr. Boys, in the Agricultural Survey of this county, has divided it into eight districts, according to the nature of the soil and produce: these respectively comprehend the Isle of Thanet; the upland farms of East Kent; the rich flat lands in the vicinity of Faversham, Sandwich, and Deal; the hop-grounds, &c. of Canterbury and Maidstone; the Isle of Sheppey; the upland farms of West Kent; the Weald of Kent; and Romney Marsh. The Isle of Thanet forms the north-eastern angle of Kent, from the main land of which it is separated by the river Stour and the water called the Nethergong: its length is about nine miles, and its breadth about five. This district is in a very high state of cultivation, and of very remarkable fertility; its soil, though originally a light mould on a chalky bottom, having been greatly improved by the inexhaustible store of manure supplied by the sea. The whole isle contains about 3500 acres of excellent marsh land, and 23,000 acres of arable; those of the latter, which border on the marshes, are the most productive; though even the uplands are rendered extremely fertile by the excellent modes of cultivation. The general routine of crops on the lighter soils is fallow, barley, clover, and wheat; but a crop of peas is occasionally introduced instead of the fallow; and sometimes beans in the place of the clover. Where the round-tithed course is pursued in the rich sandy loam lands, the general routine is beans, wheat, and barley. Canary-seeds are likewise grown here in great quantities, as well as radish, spinach, mustard, cabbage, and other esculent plants for the London markets. The marsh lands are principally applied to the fattening of sheep and cattle. The upland farms of East Kent may be described as including an open and dry tract of land, lying between the city of Canterbury, and the town of Dover and Deal; and another tract, inclosed with woods and coppice, extending from Dover, by Elcham and Ashford, to Rochester, in length; and from the isle of Sheppey to Lenham, &c. in breadth. The former tract includes a great variety of soils, scarcely those of any two farms being similar. Stiff clays are principally met with on the tops of

the highest hills about Dover; flinty tracts occur in the valleys in the same neighbourhood, and about Stockbury near Maidstone. The woodlands in East Kent are dispersed chiefly between the great road from Rochester to Dover, and the chalk hill that runs from Folkestone, by Charing to Detling. These furnish the adjacent country with fire-wood, and the dock-yards with timber for ship-building; but the most material part of their produce, is the immense quantity of hop-poles cut out for the neighbouring plantations. The wood is generally cut at from ten to fourteen years growth, and its value is estimated by the quantity of hop-poles produced. The rich flat lands in the vicinity of Faversham, Sandwich, and Deal, lie nearly on a level, are extremely fertile, and excellently managed under a general system. They are almost entirely arable; the soils are a rich sandy loam, intermixed with sand, and a stiff wet clay. In the vicinity of Sandwich are many orchards, which in some years produce large quantities of good apples, the greater part of which is conveyed by the coal vessels to Sunderland and Newcastle. The hop-grounds, extending from Maidstone and Canterbury to Sandwich, are very productive, and under a good system of management; though the soils are different, as well as the kind of hops cultivated. The plantations have of late years been greatly increased, particularly in those parts contiguous to Maidstone, Faversham, and Canterbury; the plantations called the City Grounds, extend through a circuit of two miles and a half round Canterbury, and are estimated to include from 2500 to 3000 acres. The hops grown here, and in the grounds running hence to Sandwich, are very rich in quality, and in much request for their great strength; if well managed, they are also of a good colour. Those grounds are found most productive, which have a deep rich loamy surface, with a sub-soil of deep loamy brick earth; and this kind of land forms the principal part of the plantations of East Kent; though there are some good grounds where the surface is very flinty. The produce is subject to great fluctuation; in some years amounting to fourteen or fifteen hundred weight per acre; in others not exceeding two hundred. In drying hops, a small quantity of brimstone is sometimes used, in order to suffocate the insects, and occasion a more speedy evaporation of the superfluous moisture: by the use of the sulphur, the hops are thought also to be improved in colour. In the plantations of Maidstone, and its vicinity, very great crops of hops are grown; but they are inferior in quality to those of Canterbury and East Kent. The soil is what is locally termed stone flatter; that is, where there is a mixture of small pieces of stone and sand: the sub-soil is called Kentish rag, and burns into good lime. The hop plantations afford employment to great numbers of the poorer classes, not only of this, but of other counties; and the motley groups that assemble to assist in hop-picking are truly amusing. Hops are generally regarded as having been introduced into this country about the time of Henry VI.; and in the year 1428, they were petitioned against as *wicked weed*. This, however, can only refer to the use of them, for they are found wild in almost every part of Britain. They came into more general use in the reigns of Henry VIII. and Elizabeth. Nearly one-fourth of the whole produce of the hop-duty in England, is paid from the plantations of East Kent. Besides the hop-grounds, the neighbourhood of Maidstone is celebrated for apples, cherries, and filberts; many small fields, of from one to fifteen acres, being planted with different species of these kinds of fruit; it is also a common practice to plant hops, apples, cherries, and filberts, all together. The apples intended for cyder, are generally gathered towards the end of October, and after being laid in heaps to ripen, under cover, are manufactured for use.

In plentiful years the cyder fruit sells for fourteen-pence per bushel. The apples appropriated for domestic uses are sold to the fruiterers, who send them to London by the hoys, or to the north of England by the coal vessels. The cherries, which are of the white and black heart, Hertfordshire-black, red, and Flemish or Kentish kinds, are usually sold to higliers, who retail them on the sea-coast by the sieve or basket, containing forty-eight pounds each; or else they are sent by water to London, and consigned to the fruit-factors. The filberts are mostly disposed of in the same manner. The Isle of Sheppey is separated from the rest of Kent by an arm of the sea, called the Swale, which is navigable for vessels of 200 tons burthen. Its length is about eleven miles, and its breadth eight; four-fifths of it consisting of marsh and pasture lands; the remainder is arable. The prevailing soil is a deep, strong, stiff clay, through which the plough can hardly be forced. The upland farms of West Kent include a great variety of soils, and are cultivated under various systems of husbandry. This district is more inclosed than the eastern part, and produces greater quantities of timber and underwood, particularly on the upper or westernmost side. The waste and common lands of this district form an extent of many thousand acres. The turnpike roads are mostly in good condition; but the cross roads of West Kent are frequently impassable for carriages. The Weald of Kent is a considerable and remarkable tract, stretching along the south side of the county, from Romney Marsh, to Surry; on the north it is bounded by the range of hills which enter the county near Well-treet, and extends, in nearly a due westerly direction, to Sutton and Egerton, and thence south-eastward to Hythe; on the south it stretches to the confines of Sussex, and includes the Isle of Oxney. This district was in ancient times an immense wood or forest; wholly destitute of inhabitants, excepting swine and deer. By degrees, however, it became peopled, and is now every where interspersed with towns and villages; though it still contains some extensive and flourishing woodlands. Its present name is Saxon, and signifies a woody country; but the Britons called it *Coit Andred*, the great chase or forest. The whole was a demesne of the Saxon kings; and there are still certain privileges annexed to the possession of the lands, which induce the proprietors to contend for being within its limits. "It is said," Mr. Haisted observes, "that within the Weald, the proof of woodlands having ever paid tythe, lies on the parson, to enable him to take tythe of it, contrary to the usual custom in other places, where the proof of exemption lies on the owner; nor are the lands in it subject to the statute of woods; nor has the lord waste within the Weald; the timber growing thereon belongs to the tenant. This latter custom of excluding the lord from the waste, is called *land peerage*." The Weald, when viewed from the adjoining hills, which command the whole extent, exhibits a most delightful landscape, interspersed with small eminences, highly cultivated, and animated by farm-houses, seats, and villages, promiscuously scattered among towering oaks and other trees. Romney Marsh is an extensive level tract of rich marsh land lying on the southern coast, and comprehending, in itself, about 23,925 acres; but when described, as it frequently is, in connection with Walland Marsh, which adjoins it on the south-west, and Denge Marsh, which connects with the latter on the south-east, it includes about 43,326 acres; Walland Marsh containing 16,489, and Denge Marsh 2912. The whole level, however, is yet more extensive; for Guildford Marsh, which adjoins Walland Marsh on the west, comprises 3265 acres; most of this latter tract is in Sussex. The beautiful appearance of these levels in the summer season, when the entire surface is clothed with luxuriant ver-

ture, and covered with numerous flocks of sheep and droves of cattle, cannot fail to excite considerable interest in every observer. The Marsh is defended against the violence of the sea by an immense bank of earth, of great strength, called Dimchurch-Wall, which extends above three miles in length. This wall is the sole barrier that prevents the sea from overflowing the whole extent of the level; and as it is for the general safety, so "as it is supported," says Haisted, "as well as the three grand sluices through it, which are for the general drainage of the marshes, by scots levied over the whole of it; but the interior drainage, which is portioned out into a number of divisions, called waterings, is provided with sewers, and maintained at the expence of the respective land-holders, by a rent raised separately on each" in proportion to their own watering. In that portion of the Marshes within this county, are comprehended the two corporate towns of New Romney and Lydd, and sixteen other parishes. The inclosures are principally formed by ditches and a rail fence. The soil of these spacious levels has been almost wholly deposited by the sea, and consists principally of a fine, soft, rich, loam and clay, with a greater or less proportion of sea-sand intermixed. The sub-soil consists of alternate layers of sand and clay, with sea-beach occasionally intervening. In many places throughout the Marsh, at the depth of three or four feet, have been frequently dug up oak leaves, acorns, &c. together with large trees lying in different directions; some across each other; some appearing with the roots to them, as if overturned by a storm, or other convulsion of nature; and others as if cut down with an axe or sharp instrument; the colour being as black, and the wood as hard, as ebony. These marshes are almost entirely appropriated to the grazing and fattening of sheep and cattle, but chiefly to the former, which are bred and fed here in immense quantities; their number, perhaps, exceeding that of any other district in the kingdom. Romney Marsh has generally been considered as unhealthy; and probably this opinion has operated to keep it thinly peopled. Of late, however, its salubrious qualities have been greatly improved; a change attributed to the attention that has been given to keep the ditches free from stagnant and putrid water. The extent and rental of farms in Kent are uncommonly various, as must be evident when the peculiar customs of the county are considered in connection with the diversities of the soils and surface. The number of freeholds in the county is stated, by Mr. Haisted, at about 9000; independent of the large estates of the churches of Canterbury and Rochester, and of various corporate bodies. The copyhold and customary tenants are very few. The general distribution of the freeholds, and their close intermixture with each other, occasion a very frequent intercourse between the gentry and the yeomen, and thus generate that equality of sentiment so favourable to the interests of individual right.

The manufactures carried on in Kent are various, though not particularly extensive. The clothing trade, which once gave employment to great numbers of its inhabitants, is now nearly forgotten in the county. At Canterbury, muslins, brocaded silks, and stockings, are made; at Deptford and Whitstable are large copperas works; at Stoner, in the Isle of Thanet, and likewise in the Isle of Grain, salt is manufactured; at Ospringe is an extensive manufactory for gunpowder, erected by government; and there is also another near Dartford; in the Weald, bordering on Sussex, are various iron furnaces; and at Dartford and Crayford are mills for the manufacturing of iron; at the latter place also, are extensive works for the printing of calicoes, and spacious grounds for the bleaching of linens; at Seven Oaks are large silk mills; and at Boxley, near Maidstone, is the most ex-

tensive and curious manufacture of paper, perhaps, in Europe; paper is also made in the vicinity of Dartford, and some other places. The various dock-yards at Deptford, Woolwich, Chatham, &c. provide employment for numerous artisans in all the different branches of naval affairs; ship-building is also carried on at other places on the sea-coast.

The religious houses, or monastic establishments, in Kent, were formerly very numerous, and their net annual income, at the periods of their dissolution, amounted to 9000*l*. Among them were two abbeys, three priories, and five nunneries, of the Benedictine order; one priory of the Cluniac; one abbey of the Cistercian; of secular canons, five colleges; of regular canons, four abbeys and five priories, one of which was Premonstratensian: of friars, there was one priory and one nunnery of Dominicans; two priories of Franciscans, one priory of Trinitarians, three priories of Carmelites, and four alien priories: there were also two commanderies of knights hospitallers of St. John of Jerusalem; and fifteen hospitals; besides various hermitages, chantries, and free chapels.

The number of castles that have been erected in Kent is very considerable; and many of them yet remain, in different degrees, almost perfect. Of these, the immense fortress of Dover is the principal; and this is now garrisoned with a strong force, as are also several others on the sea-coast; but most of the castles in the interior of the county are dismantled and mouldering into ruins.

The principal rivers that intersect or bound this county are the Thames, the Medway, the Greater and Lesser Stoures, the Rother, the Darent, the Cray, and the Ravensborne. The Thames, the Tamesis of Cæsar, which has a very important influence on the trade and commerce of this county, will be fully described in its place. (See THAMES.) The Medway, which is more peculiarly a Kentish river, was called Vaga by the Britons, a name descriptive of its very sinuous course and mazy wanderings. The Saxons changed this appellation to Medweg and Medwege, of which the present name is a corruption. This river has four principal sources, of which only one is in this county; two being in Suffex, and the other in Surry. That branch which enters Kent from Surry, rises in Blechingley parish, and having been joined by several rills, flows on to Eaton bridge, Haver cattle, and Penhurst, near which it receives one of the branches that rise in Suffex, and proceeds to Tunbridge. A little above this town the river separates into several channels, one of which is navigable and is again joined by the other division about two miles below Tunbridge. At Yalding it receives the united waters of the other two principal branches, and flows in a winding direction to Maidstone, and gradually augmenting in depth and breadth, pursues its picturesque course to Rochester, where the scenery is peculiarly beautiful. Proceeding hence towards Sheerness, it passes Chatham, Upnor Castle, and Gillingham Fort, and flows onward to the Thames, which it enters between the Isles of Grain and Sheppey, having first united its waters to those of the Swale. The Medway, with its numerous tributary streams, is calculated to overspread a surface of nearly thirty square miles in the very midst of Kent. The tide flows almost as high as Maidstone; but at Rochester bridge it is exceedingly strong and rapid; and below that, all the way to Sheerness, a distance of about twenty miles, the bed of the river is so deep, and the reaches so convenient, that many of the largest line of battle ships are moored here, when out of commission, as in a wet dock, and ride as safely as in any harbour in Great Britain. The Medway was first made navigable to Tunbridge about the middle of the last century, under the provisions of an act of parliament passed in the year 1740; though an act had been procured for the pur-

pose in the reign of Charles II. The Greater Stoure has two principal branches, both of which rise in this county; the first at Well-treet near Lenham; the other among the hills between Liminge and Potting. These streams unite near Ashford; whence the Stoure proceeds to Canterbury, through which it flows in a divided stream, and again unites a little below that city. The Lesser Stoure rises in the vicinity of Liminge, and directing its course northward, has its waters increased by several small rills, and sometimes by a temporary water called the Nailbourn, which, after continued rains or sudden thaws, issues from several springs and forms a strong current. The Rother, formerly called the Limene, rises at Gravel-hill, in the parish of Rotherfield, in Suffex, and flowing eastward becomes the boundary of this county below Sandhurst and Newenden. The Darent rises on the borders of this county and Suffex, near Weathersham, whence flowing to the north-east, it passes on to Riverhead, where it turns to the north, and flows in that direction to South Darent. The Cray, and the Ravensbourne, are only small streams; the former has its source at Newell, in Oppington parish, the latter rises on Keston Downs, near an ancient Roman encampment. Haisted's History and Antiquities of Kent, 12 vols. 8vo. Beauties of England and Wales, vol. vii. 1806.

KENT, a county of America, in Maryland, on the east shore of Chesapeake bay, bounded E. by Newcastle, and part of Kent county, Delaware, and W. by Chesapeake bay; about 32 miles long. and 13 broad; containing 11,771 inhabitants, including 4474 slaves. Its chief town is Chester.

KENT County, in Upper Canada, extends northward to the boundary line of Hudson's bay, including the whole territory to the westward and southward of that line, to the utmost extent of the country known by the name of Canada. — Also, a county of Rhode island, lying S. of Providence county, on the W. side of Narraganset bay; 20 miles long and 10 broad; divided into four townships, and containing 8487 inhabitants. — Also, the middle one of the three counties of Delaware; 40 miles from N. to S. and 26 from E. to W.; containing 10,544 inhabitants, including 1485 slaves. The lands in this county are esteemed the richest in the state. It is well watered by several small streams that empty themselves into the Delaware. The chief town is Dover. — Also, an island in Queen Ann's county, Maryland, and the largest in Chesapeake bay; 12 miles from N. to S. and six broad. It has a post-office. — Also, a township in Litchfield county, Connecticut, bordering on the state of New York, and 8 or 10 miles W. of Litchfield; containing 1607 inhabitants.

KENTAISSE, a ridge of mountains of Thibet, between the heads of the Ganges and the Sanpoo rivers. N. lat. 30° 40'. E. long. 80° 49'.

KENTHI, a town of Poland, in the palatinate of Cracow; 30 miles S.W. of Cracow.

KENTSHIAN, a mountain of Thibet; 3 miles E. of Sarangpour.

KENTUCKY, a crooked river of America, which rises in the state of the same name, and after a general N.W. course of 200 miles, falls into the Ohio; N. lat. 38° 35'. W. long. 85° 30'. It is sometimes called "Cattawa." Its source is in the Laurel mountains, and it interlocks with Licking river. Its mouth, which is 250 yards wide, is 77 miles above the Rapids, and 626 below Pittsburg. The river is navigable 130 miles, though its current is rapid, the banks being high and rocky. It is said that black-lead mines have been found on the head waters of this river. Little Kentucky river is 25 yards wide, and 3 miles W. of Kentucky river.

KENTUCKY, one of the United States of America, bounded

KENTUCKY.

bounded N.W. by the river Ohio, W. by Cumberland river, S. by Tennessee state, E. by Sandy river, and a line drawn due S. from its source, till it strikes the northern boundary of Tennessee. It lies between $36^{\circ} 30'$ and $39^{\circ} 30'$ N. lat., and between 81° and 89° W. long., is about 250 miles long, and 200 broad; and contains 50,000 square miles. It was well known to the Indian traders many years before its settlement: a map of it was made from their description in 1752; and it was farther explored in 1754 and 1769. But it was first settled by Col. Daniel Boone in 1773; erected into an independent state by act of Congress, in December 1790; and received into the Union in June 1792. Kentucky, which was originally divided into two counties, Lincoln and Jefferson, has been since subdivided into 42, as in the following table.

Counties.	No. of In. in 1800.	No. of Slaves in 1800.	Chief Towns.	No. In.
Fayette	12,233	3,786	Lexington	1,795
Jessamine	5,438	1,553	Nicholasville	23
Woodford	6,452	2,058	Verfaillies	172
Scott	7,659	1,787	Georgetown	348
Mason	11,405	1,603	Washington	570
Bracken	2,382	191	Augusta	143
Harrison	4,263	393	Cynthiana	87
Pendleton	1,573	239	Falmouth	40
Clerk	7,523	1,535	Winchester	130
Montgomery	6,999	749	Mount Sterling	83
Fleming	4,893	240	Flemingsburg	123
Floyd	472	29	Prestonsbury	6
Franklin	4,450	1,109	Frankfort	628
Gallatin	1,078	276	Port William	213
Boone	1,534	325		
Campbell	1,797	258	Newport	106
Henry	3,258	406		
Nicholas	2,863	322	Newtown	62
Bourbon	12,356	1,994	Paris	377
Mercer	9,242	2,169	Danville	280
Garrard	6,083	1,234	Lancaster	103
Nelson	9,087	1,735	Beardston	579
Bullitt	3,446	944	Shepardsville	96
Green	6,025	816	Greensburg	71
Cumberland		236		
Shelby	8,929	1,409	Shelbyville	262
Jefferson	8,395	2,330	Louisville	359
Lincoln	8,555	1,750	Stanford	66
Harden	3,597	310	Elizabethtown	56
Breckenridge	758	38	Hardensburg	49
Ohio	1,121	122	Hartford	73
Polaski	3,361	232		
Knox	1,119	62		
Henderfon	1,263	340	Henderfon	205
Livingston	2,787	444	Eddyville	69
Christian	2,318	297		
Logan	5,690	730	Russellville	127
Warren	4,645	417	Bowling-Green	41
Muhlenburg	1,517	116	Greenville	26
Barren	4,784	505		
Washington	8,887	1,382	Springfield	163
Madison	10,380	1,688	Richmond	110
Total 42	220,959	40,343		
Total 1790	73,677	12,430		
Increase in 10 years	147,282	27,913		

In January 1799, the legislature passed an act, apportioning representation, and distributing the state into senatorial districts. This act provides, that the house of representatives shall be composed of 62 members, elected from the several counties, according to the ratio of one for every 500 qualified electors, and that the senatorial branch of the legislature shall consist of 24 members.

The whole extent of the north-western side of Kentucky is washed by the river Ohio; the principal branches of which, that serve to water this fertile tract of country, are Sandy, Licking, Kentucky, Salt, Green, Tennessee, and Cumberland rivers. These again branch out into rivulets and streams, which, pursuing different directions, serve to fertilize the whole country. In the dry season, however, many of them disappear, and the inhabitants are distressed for want of water. At the bottoms of these water-courses, the lime-stone rock, which is common in this country, appears of a greyish colour; but where it is exposed to the air, in its natural state, it appears like brown free-stone. On the banks of these streams the stone has the appearance of fine marble, being of the same texture, and found in great plenty. In this country there are five noted salt-springs or licks, which supply abundance of salt for use and exportation. The whole country lies upon a bed of lime-stone, generally about six feet below the surface, except in the vallies, where the soil is much thinner. A tract, about 20 miles wide, along the banks of the Ohio, is hilly, broken land, interspersed with many fertile spots. The rest of the country is agreeably uneven, formed of gentle ascents and descents. The vallies are commonly narrow, and the soil thin and inferior in quality; and that along the ascending ground is frequently not much better; though it is sufficiently deep for vegetation, as the size of the trees indicates. The soil is either black, or tinged with a brighter or deeper vermilion, or is of the colour of dark ashes. In many places there are appearances of potter's clay, and of coal in abundance. Although this country is generally hilly or mountainous, and in many parts barren, it has various plains and strips of land fit for pasturage and the rearing of cattle; and a project has been accomplished of cutting a road through the most mountainous part from Kentucky, to pass by the sweet springs in Virginia, and thence to Winchester, by which a saving is made of 200 miles in distance from the one to the other. This country is well timbered. Of trees of the natural growth of the country we may reckon the elm, the beech, the ash, the juniper, the sugar, the coffee, the papaw, the hackberry, and the cucumber. The two last are soft wood, and bear a fruit of the size and shape of the cucumber. The coffee tree resembles the black oak, and bears a pod, that incloses a seed, of which is prepared a liquor not unlike coffee. Beside these there is the honey-locust, the black mulberry, and wild cherry, of a large size. The buck-eye, an exclusively soft wood, is the horse chestnut of Europe. The magnolia bears a beautiful blossom of a rich and exquisite fragrance. Such are the variety and beauty of the flowering shrubs and plants, which grow spontaneously in this country, that in the proper season the wilderness appears in blossom. The accounts that have been given of the fertility of the soil in this country have, in some instances, exceeded belief, and probably have been exaggerated. However, it is allowed that some parts of Kentucky, particularly the high grounds, are remarkably good. The lands of the first rate, it is said, are too rich for wheat, and will produce 50 or 60, and in some instances, 100 bushels of good corn per acre. In common, the land will yield 30 bushels of wheat or rye per acre. Barley, oats, flax, hemp, and vegetables of all kinds, common in this climate, yield an abundant increase. Cotton is seldom, and with difficulty brought

brought to perfection. Irish potatoes thrive well; but sweet potatoes are raised with difficulty. A species of rye was found by the first settlers growing wild in Kentucky, and on the lands near the Ohio. It had a bearded ear like the cultivated rye, the beard somewhat longer, and the grain less. The staple commodities in this state are wheat and tobacco; but as the circumstances of distance from a market, and the difficulty of navigating the Mississippi, render them unprofitable to the cultivators, they are turning their attention to the raising of hemp, for which the soil is well adapted. The rivers abound with fish of various sorts; and as swamps are rare in Kentucky, the reptiles which they produce, such as snakes and frogs, &c. are not numerous. The honey-bee may be called a domestic insect, as it is said not to be found but in civilized countries. Accordingly, it is a common saying among the Indians, when they see a swarm of bees in the woods, "Well, brothers, it is time for us to decamp, for the white people are coming." The quadrupeds, except the buffalo, are the same as in Virginia and the Carolinas. The climate, if we except a few places in the vicinity of ponds and low grounds, is healthy and delightful. Their inhabitants do not experience the extremes of heat and cold. In 1798 the greatest heat was 89° Fahrenheit. The weather in winter is fluctuating. Snow seldom falls deep or lies long. The winter begins about Christmas, and is never longer than three months, commonly two, and is so mild that cattle can subsist without fodder. Fahrenheit's thermometer seldom falls below 35° in winter, nor rises above 80° in summer. The approach of the seasons is gradual; the summer continuing till the middle of October, the autumn or mild weather till Christmas, and the spring appears to produce effect in March, and by the middle of April, the foliage of the forests is completely expanded. Kentucky has various minerals. A valuable lead mine has been discovered between Cumberland and Green rivers. Marble, chalk, gypsum, and oolites are found in different places. The country affords also iron, copper, sulphur, nitre, copperas, alum, &c. From the caves on Green river earth is collected for salt-petre; and many of the inhabitants manufacture their own gun-powder. Iron-works are established. Paper-mills, oil-mills, fulling-mills, saw-mills, and a great number of valuable grist-mills, are erected. Several valuable tanneries have been established in different parts of the country. Attempts are made, on a large scale, for the culture of vineyards, and the introduction of the cotton manufacture. The salt-works are more than sufficient for the supply of all the inhabitants, at a low price. Considerable quantities of sugar are made from the sugar trees. The amount of exports from this state, in 1801, was 626,673 dollars. Malt liquor, spirits distilled from corn and rye, and the juice of the sugar-tree, mixed with water, constitute the ordinary beverage of the country. No preference is given to any one religious denomination in this country. The Presbyterians, Baptists, and Methodists, are the most numerous. Among the natural curiosities of the country may be reckoned the banks of Kentucky and Dick's river. Here may be observed 3 or 400 feet of solid perpendicular rocks, in some parts of the lime-stone kind, or in others of fine white marble, curiously chequered with strata of astonishing regularity; so that the rivers appear like deep artificial canals. Their high rocky banks are covered with red cedar groves. Caves have also been discovered in this country, several miles in length, under a fine lime-stone rock, supported by curious arches and pillars. Springs that emit sulphureous matter have been found in several parts of the country. Near Lexington are found curious sepulchres, full of human bones.

By the constitution of this state, formed and adopted in

1792, the powers of government are divided into three distinct departments; legislative, executive, and judiciary. The legislative is vested in a general assembly, consisting of a senate and house of representatives (see the beginning of this article); the supreme executive in a governor; the judiciary in the supreme court of appeals, and such inferior courts as the legislature may establish. The representatives are chosen annually by the people; the senators and governor are chosen for four years by electors appointed for that purpose; the judges are appointed during good behaviour, by the governor, with the advice of the senate. The declaration of rights asserts the civil equality of all; their right to alter the government at any time; liberty of conscience; freedom of elections and of the press; trial by jury; the subordination of the military to the civil power; the rights of criminals to be heard in their own defence; the right of the people to petition for redress of grievances, to bear arms, and to emigrate from the state. It prohibits unreasonable searches and seizures; excessive bail; confinement of debtors, unless there be presumption of fraud; suspension of habeas corpus writ, unless in rebellion or invasion; ex post facto laws; attainder by the legislature; standing armies; titles of nobility, and hereditary distinctions. The legislature of Virginia, while Kentucky belonged to that state, made provision for a college in it, and endowed it with very considerable landed funds. There has been since established a college at Lexington, called "Transylvania," regularly organized and well endowed, having a fund of 14,000 acres of land. The officers of the university are a president and two professors, in the literary departments; three medical professors, in the school of medicine; and a professor of law: a divinity professorship has been also contemplated. The library, supplied chiefly by liberal gentlemen in England, amounts to near 3000 volumes; and the philosophical apparatus is gradually enlarging. In Lexington there is also a circulating library of about 1000 volumes. Schools, in several towns, are liberally encouraged and supported. The distance from Philadelphia to Kentucky by land is from 7 to 800 miles; from Baltimore nearly 700; nearly 600 from Alexandria; and upwards of 500 from Richmond. Morfe.

KENTZINGEN, a town of Germany, in the Brisgau, about a mile from the east side of the Rhine; 13 miles N.W. of Friburg.

KENYON, LLOYD, in *Biography*, was born at Greddington, in Flintshire, in the year 1733. He was educated at Ruthin school in Denbighshire, after which he was articled to Mr. Tomlinson, an attorney at Nantwich, in Cheshire. When he had completed his clerkship, he entered himself a member of the society of Lincoln's Inn, and was called to the bar in 1761. He now began to practise as a conveyancer, and soon obtained a high reputation as a sound lawyer, which was the means of introducing him to notice in the chancery court. Still, however, he made no figure at the bar, till the trial of lord George Gordon, in 1790, gave him an opportunity for a full display of his talents; and from this moment he was looked up to with respect by his brethren at the bar. In 1782, he was made attorney general, and chief justice of Chester; and, much about the same time, he was returned to parliament for Hindon in Wiltshire. In 1784, he was appointed to the office of master of the Rolls; and on the resignation of the earl of Mansfield in 1788, he was, by the zealous recommendation of lord Thurlow, raised to the office of chief justice of the king's bench, and ennobled with the title of baron Kenyon. He died at Bath in April 1802, leaving two sons, George the present lord, and the honourable Thomas Kenyon. Gent. Mag.

KEOGANG, in *Geography*, the most westerly of the branches or mouths of the river Ava, in Pegu, which runs into the sea near Cape Negrais.

KEOWE, or **KROWEE**, the name given in America to the Savannah river, above its conflux with the Tugulo, the west main branch.—Also, the ancient name of the populous town and territory of the Cherokee Indians, on the river of that name. The soil is fertile, and the adjacent heights might, with little expence, be rendered almost impregnable. The fruitful vale of Keowe is seven or eight miles in extent, terminated by a high ridge of hills, and opening again to an extent of ten or twelve miles down to Sinica, and in breadth one or two miles. This was once a thickly inhabited settlement, well cultivated and planted. To the feeble remains of the once potent Cherokees it now exhibits a different spectacle.

KEOZEE, a town of Birmah, on the Irawaddy; 15 miles N.E. of Pagahm. This town is ornamented with several neat temples.

KEPELDEE, a town of Hindoostan, in the country of the Nays; 30 miles E. of Tellicherry.

KEPHER KENNA, a village of Palestine, said to be the ancient "Cana," where our Saviour changed the water into wine.

KEPLER, JOHN, in *Biography*, a celebrated astronomer and mathematician, born at Wiel, in the duchy of Wirtemberg, December 27th, 1571, was son of Henry Kepler, an officer in the army, who had served his country with distinction, but who, by misfortunes, was reduced to low and narrow circumstances. He gave his son the best education in his power, though the youth was subject to many difficulties, by being sent to different places, and by being put under different masters. His genius and avidity for knowledge animated him to surmount every obstacle, and to make a very rapid proficiency. He was sent to Tübingen to pursue his academic studies, and was admitted to the degree of bachelor in 1588, and to that of master of philosophy in 1591. He applied himself to mathematics and theology, and undertook the duties of the ministry for a short time. But his inclination being decidedly in favour of mathematics, he resolved to devote his whole time and strength to the science; and so high was his reputation, that in the year 1594 he was invited to Gratz, in Stiria, to fill the mathematical chair in the university of that city. In the year 1596, he married a lady of a noble family; and in two years from this period he was driven from Gratz by persecution on account of his religious principles; though he was soon recalled by the states of Stiria: but not thinking himself safe, he accepted a pressing invitation from Tycho Brahe to settle in Bohemia, and removed thither with his family and books in the year 600. Upon a close intimacy, Kepler was dissatisfied with the conduct of Tycho, and complained of his unwillingness as well to promote his interest, as to communicate to him all his discoveries and improvements. Tycho, however, died in 1601; but previously to this, he introduced him to the acquaintance of the emperor Rodolph, who gave him a favourable reception, and appointed him his mathematician. This title of mathematician to his imperial majesty Kepler possessed during the remainder of his life, not only under the reign of Rodolph, but under his successors, Matthias and Ferdinand. Upon the death of Tycho, the emperor Rodolph ordered him to complete the tables begun by that great man, which were to be called the "Rodolphine Tables." These, notwithstanding the vigour with which he applied himself to them, were, owing to unexpected difficulties, not completed and published till the year 1627. Having completed that work, he

obtained the emperor's leave to go and reside at Sagan, in Silesia, where he suffered much inconvenience from not having his pension regularly paid him. This circumstance obliged him to take a journey to Ratibon in 1630, to solicit for the arrears due. Here he died in November, at the age of 59 years. The account of the labours and discoveries of this great man has been given by Mr. Maclaurin, in his work on the "Discoveries of Sir Isaac Newton," and from that we shall extract the following sketch. "To Kepler," says he, "we owe the discovery of the true figure of the orbits, and the proportions of the motions of the solar system. This astronomer had a particular passion for finding analogies and harmonies in nature, after the manner of the Pythagoreans and Platonists. Three things, he tells us, he anxiously sought after from his early youth:—Why the planets were six in number? Why the dimensions of their orbits were such as Copernicus had described from observations? And, what was the analogy or law of their revolutions? He fought for the reasons of the first two of these in the properties of numbers and plane figures, without success. But at length reflecting that while the plane regular figures may be infinite in number, the regular solids are only five, he imagined that certain mysteries in nature might correspond with this limitation inherent in the essences of things: he therefore endeavoured to find some relation between the dimensions of those solids and the intervals of the planetary spheres; and imagining that a cube inscribed in the sphere of Saturn would touch by its six planes the sphere of Jupiter, and that the other four regular solids in like manner fitted the intervals that are between the spheres of the other planets; he became persuaded that this was the true reason why the primary planets were precisely six in number, and that the author of the world had determined their distances from the sun, the centre of the system, from a regard to this analogy. Being thus, as he imagined, possessed of the grand secret of the Pythagoreans, and pleased with the discovery, he published it in 1596, under the title of "Mysterium Cosmographicum." He sent a copy of this book to Tycho Brahe, who did not approve of the speculations contained in it, but wrote to Kepler, urging him first to lay a solid foundation in observations, and then, by ascending from them, to strive to come at the causes of things: and to this advice we are indebted for the more solid discoveries of Kepler. This great man, soon after the death of Tycho, found that astronomers had erred from the first rise of the science, in ascribing always circular orbits and uniform motions to the planets; and he discovered that each of them moves in an ellipsis, which has one of its foci in the centre of the sun; that the motion of each is really unequable, and varies in such a manner, that "a ray supposed to be always drawn from the planet to the sun describes equal areas in equal times." It was some years later before he discovered the analogy that there is between the distances of the several planets from the sun, and the periods in which they complete their revolutions. He has, however, left it upon record, that on the 15th of May, 1618, he found that "the squares of the periodic times are always in the same proportion as the cubes of the mean distances from the sun." When Kepler saw, according to better observations, that his disposition of the five regular solids among the planetary spheres was not agreeable to the intervals between their orbits, he endeavoured to discover other schemes of harmony. For this purpose, he compared the motions of the same planet at its greatest and least distances, and of the different planets in their different orbits, as they would appear viewed from the sun; and here he fancied that he had found a similitude to the divisions of the octave in music.

Of these notions, which are wholly unfounded in nature, he was so fond, that hearing of the discovery of the four satellites of Jupiter by Galileo, he owns that his first reflections were from a concern how he could save his favourite scheme, which was threatened by this addition to the number of the planets. The same attachment led him into a wrong judgment concerning the sphere of the fixed stars: for being obliged, by his doctrine, to allow a vast superiority to the sun in the universe, he restrains the fixed stars within very narrow limits; nor did he consider them as suns placed in the centres of their several systems, having planets revolving round them. Kepler's great sagacity, and continued meditations on the planetary motions, suggested to him some views of the true principles from which these motions flow. He speaks of gravity as of a power that was mutual between bodies; and says, that the earth and moon tend towards each other, and would meet in a point, so many times nearer to the earth than to the moon, as the earth is greater than the moon, if their motions did not hinder it. He adds also, that the tides arise from the gravity of the waters towards the moon. But not having notions sufficiently just of the laws of motion, he was unable to make the best use of these ideas; nor did he steadily adhere to them, for in his "Epitome of Astronomy," published many years after, he proposes a physical account of the planetary motions derived from different principles. Kepler was author of several pieces besides those already mentioned, of which the following may be noticed: "Prodomus Dissertationum Cosmographicarum;" "De Stella nova in Pede Serpentarii;" "Astronomia nova, seu Physica Cœlestis, Tradita Commentariis de Motibus Stellæ Martis ex Observationibus Tychoonis Braheii;" "De Cometis libri tres."

This great geometrician and astronomer, in his "Harmonices Mundi," published at Linz, in Austria, in 1619, and dedicated to our James I., speaks on the subject of music like a man who had not only thought of it as a science subservient to the laws of calculation, but in the language of one who had studied it practically as an elegant art, and been truly sensible of its powers. And though the eloquent astronomical historian Bailly says, in a sweeping decision, that "Kepler, from his veneration for Pythagoras and Plato, has plunged into musical ratios, and blended them with the movements, distances, and eccentricities, of the planets, in his visionary analogies; they contain not one single true ratio or resemblance: in a crowd of ideas there is not one single truth." This severe censure of M. Bailly must be confined to the proportions and analogies between musical intervals and the distances of the heavenly bodies: as the ratios of Kepler are accurate, as far as concerns music.

Neither Maclaurin nor Dr. Hutton have expressed themselves so harshly on his fancied similitudes to the divisions of the octave in music; which they indeed call the dreams of this ingenious man, as the harmony of the spheres had been of Pythagoras and Plato long before.

This great mathematician and precursor of sir Isaac Newton was so far from allowing to the ancients, much as he respected them, such harmony as is practised by the moderns, that he says, though Plato, in his "Republic," speaks as if something like it were in use, he supposes if they ever had any accompaniment to their melodies by way of base, it must have been such a one as is produced by the drone of a bagpipe. This is perhaps being as unjust to the ancients, as those are to the moderns, who will not allow them to have made any progress in music, because they are unable, by their compositions and performance, to cure diseases, tame wild-beasts, or build towns.

KEPLER'S *Laws*, is a term used by astronomers to denote certain analogies between the distances of the planetary bodies from the sun, and their times of periodic revolution; as also between the rate of motion in any revolving body, whether primary or secondary, and its distance from the central body about which it revolves. The latter of these, which is generally called Kepler's first law, being that which he first discovered, is commonly expressed as follows, viz.

1. Equal areas are described in equal times; that is, if a line be supposed to join the central and revolving body, this line always passes over, or describes equal areas in equal times, whether the planet be in its aphelion, perihelion, or in any other part of its orbit.

2. The squares of the times of revolution of the planetary bodies are as the cubes of their respective distances from the sun.

These laws were first discovered by Kepler, the celebrated astronomer, whose name they bear;—a name which will be perpetuated as long as the science of astronomy itself is known, and the sublimity of its laws have charms to captivate the minds of philosophers. The discovery of these analogies forms a most important epoch in the history of astronomy, as they may be considered as having paved the way to that sublime and universal system of attraction, the discovery of which has immortalized the name of Newton: for Kepler having deduced them from the comparison of actual observations, and therefore independent of any theory, they formed a very useful criterion for the corroboration of any particular hypothesis, as well as an important datum in the investigation of new theories.

In order to form a proper estimate of the value of these improvements, and the difficulty their author had to encounter in establishing them, we must look to the state of astronomy at that period. Copernicus had just revived the Pythagorean system, and Kepler was one of its ablest advocates: but still it was held as a sacred principle, that the motions of all the planetary bodies were performed in uniform circular orbits; to reconcile which to actual appearances, many ingenious contrivances were made use of, and which, it must be allowed, represented the planetary motion with considerable exactness.

The angular motion of each of the planets consists of two parts: one part increasing uniformly with the time; and another which is periodical, and acquires all degrees of magnitude within a certain limit, in the several parts of the orbit. Now every such motion was accounted for with a tolerable degree of accuracy, by the ancient contrivances of epicycles and deferents. Accordingly the ancient systems represented, with considerable exactness, those observed places of the planets that depended only on the real angular motions; as at the oppositions. But they failed when applied to the other positions of the planets, and to the latitudes, where the apparent places depend not only on the angular motions, but likewise on the relative distances. It was here that all the ancient systems were alike defective; and it was by a strict comparison of observation with theory, that Kepler at last found himself obliged to depart from that principle of uniform circular motion, which had been so scrupulously adhered to by all his predecessors.

The situation of the heavenly bodies, in respect to one another, depends upon their real angular motions, and their relative distances. But when a planet is in opposition, the apparent places, as seen from the earth and sun, are coincident, and its position is effected only by the angular motions; and, therefore, observations in opposition, being the simplest and the least liable to inaccuracy, are of great use

KEPLER'S LAWS.

in astronomy. But in observing oppositions, a practice had been introduced, that in part defeated the purpose for which such observations had been preferred to all others. A planet was reckoned to be in opposition, when its place in the heavens was removed 180° in longitude, not from the real place of the sun, but from his mean place. It is evident, therefore, that by this practice the observer was not situated in the same line with the sun and the planet, at the computed time of opposition; and, therefore, the apparent place of the planet was not entirely divested of the second inequality, excepting in the rare case when the true place of the sun coincided with his mean place. To this practice Kepler objected, and conceived the design of determining the orbit of Mars from real, instead of apparent oppositions; and he entertained the most sanguine expectations of completely reforming the theory of the planets, by his projected innovation. Kepler's intended substitution of real for mean oppositions led him to examine the practice of astronomers in another important point. It very seldom happens that a planet is found in the plane of the ecliptic, in which the motion of the sun is performed; and in order to ascertain the place of the planet in its orbit at the time of observation, a reduction from the ecliptic to the plane of the orbit becomes necessary: and in examining the ancient methods of reduction, Kepler found them to be erroneous and inconsistent; and his investigation ultimately established this important conclusion, "that the orbits of the planets are invariable planes, intersecting each other in lines passing through the sun's centre." This was a most important improvement, and of greater consequence in simplifying the science of astronomy than any that had been introduced in all the preceding ages; and his successful and decisive establishment of its truth may be justly ranked among his greatest discoveries.

Kepler having overcome all the difficulties that opposed his projected innovation, at length completed a theory of Mars, derived solely from apparent oppositions; and its accuracy was unquestionable in representing the oppositions; but it totally failed when applied to the latitudes, and to the longitudes out of opposition. Disappointed in the high expectation he had formed of his new theory, he yet drew from its failure an important inference, the first step to emancipation from the ancient prejudice of uniform circular motion. For as the theory involved only two suppositions, *viz.* that the orbit of Mars was a circle, and that the motion of the planet was uniform about a fixed point in the line of apsides, he justly concluded that one at least of these two suppositions was false. He now prepared for further researches; but, first of all, judged it necessary to examine the circumstance that affected the theory of the earth's annual motion: for as the latitudes of the planets, and the longitudes out of opposition, (the phenomena which had hitherto rendered his attempts abortive,) depended on the distances of the earth from the sun, it was requisite to be assured that no errors crept in from this quarter.

Nor was Kepler without suspicions of inaccuracy in the terrestrial orbit. He had early remarked it as an anomaly, that an equant was assigned to all the planets, the Earth or Sun excepted; and although the authority of all astronomers was against him, he even then presumed to doubt the justness of the exception. Resuming the examination of this point on the present occasion, he established, by multiplied and undeniable proof, that the eccentricity was bisected in the orbit of the Earth or Sun, as well as in the orbits of the other planets. Kepler, in turning his attention to the solar theory, had also a farther improvement in view, *viz.* a method for deriving the equa-

tions of the planetary orbits from a less arbitrary and precarious principle than that of the equant, or a centre of uniform angular motion. He had remarked, that it is a general fact in the solar system, that the velocity of a planet diminishes as it recedes from the Sun, and increases as it approaches that luminary; and he concluded, that these two quantities, the velocity of a planet, and its distance from the Sun, must be related according to some law, which, if discovered, would enable astronomers to calculate the rate of a planet's motion for all points of its orbit, and, of course, to determine the equation, or correction due to the mean motion in every such point. This was undoubtedly the conclusion of a man of genius and originality; for though we are now familiar with the notion, that whenever the variations of one quantity depend on those of another, the one of the quantities may be expressed by some functions of the other; yet, in the days of Kepler, it must have required no small effort of generalization to perceive this truth, and the important consequences which result from it. Great difficulties, however, stood in the way of the investigation; and Kepler had to struggle, not only with his own precipitancy, which frequently led him into error, but with the imperfections of the geometry of that age, which were great in all matters connected with the quadrature of curves.

His ingenuity and perseverance, however, at last prevailed. He found that the times of describing small arcs of the Earth's orbit, arc as the distances from the Sun; that therefore the times of describing any arcs whatever, must be as the sums of those distances; and having satisfied himself, from geometrical considerations, that the sum of the distances may be expounded (at least nearly) by the area contained between the arc and the radii drawn from its extremity to the centre, he inferred that the times of describing any arcs whatever, are proportional to these areas, or which is the same, *That equal areas are described in equal times.* In consequence of this improvement, Kepler began to speculate on the nature of the force which produced so curious an adjustment; but the honour of this discovery was reserved for the genius of the immortal Newton. When he again resumed the consideration of the orbit of Mars, he soon saw reason to conclude that this body described its orbit under the guidance of the same law that he had just found to hold on the Earth; *viz.* that the areas described by a line drawn from the planet to the Sun, are every where proportional to the time of description.

The attempt, however, of computing the equation of Mars's motion on this principle, was attended with much difficulty, on account of the great eccentricity of the orbit, but still more from that prejudice in favour of the old doctrine of circular orbits, which has been already mentioned. In his new method of computing the equations, Kepler supposed the orbit to be accurate; but the results, from the combination of the two principles, were such as could not be reconciled with the places of Mars, observed by Tycho Brahe. In this dilemma, finding that he must give up one of the principles which he had adopted in his calculation, he first proposed to sacrifice his own theory to the authority of the old system; thus giving one of the most memorable examples which has ever occurred, of the influence of candour and prejudice at the same moment. He soon found, however, that this sacrifice would not answer his purpose, and that, in order to make the calculus agree with observations, it was the old hypothesis, and not the new one, that must be abandoned.

Thus the idol was overthrown by which Kepler had been so long deceived, and the emancipation of astronomy was achieved;

achieved; but many difficulties were yet to be overcome, before the empire of truth could be firmly established.

It was proved, that the orbit of Mars was not circular, but its real form was yet undiscovered. The hypothesis which first presented itself was, that this orbit is an oval or ellipsis, coinciding with the supposed circular orbit at the two apses, but falling very much within it in the middle between them; and Kepler having assigned the proportions of the longer and shorter axes of the curve, according to views that he thought sound, but which proved to be extremely fallacious, proceeded to describe the ellipsis, to obtain its quadrature, to cut its area in any given proportion, and to derive from thence the equations of the mean motion; all which was accompanied with such labour as nothing but his fortitude and perseverance would have been able to overcome. He compared the distances of Mars, thus computed, for no less than forty different arcs of anomaly, with the same as deduced from observation, and had the mortification to find, that they did by no means agree, but that the real places of the planet fell as far without the new oval, as within the old circular orbit. After trying many different means of correcting these errors with incredible labour, and always subjecting each hypothesis to the severest test, he found, at length, that an ellipse, with the sun in one of its foci, and its greater axis equal to the mean distance of Mars, represented the whole motion of the planet with wonderful exactness. *The planets, therefore, describe ellipses, having the sun in their common focus*; and this is the second great discovery which delighted the mind, and has immortalized the name of Kepler.

His third discovery was that of a law of no less importance than either, the description of equal areas, or the elliptic orbits of the planets; but it was made more easily than them, and without the same elaborate deductions. His strong propensity to trace out laws and discover analogies in nature, set him eagerly at work to find out what relation subsists between the distances of the planets from the sun, and the times of their revolutions round him. The data here lay in a much smaller compass, and were much less various than in the two former researches; and Kepler, after making some fanciful comparisons between the distances of the planets, and the regular solids in geometry, and also between the same and the divisions of the monochord, thought at last of comparing the different powers of these quantities with one another, from which comparison, though not without some abortive attempts, this truth at last emerged, *that the squares of the periodic times of the planets, are as the cubes of their mean distances from the sun*. He expressed, in strong terms, the delight and astonishment he felt on the discovery of this simple and beautiful analogy. He has carefully marked the day on which the discovery was made, (8th May, 1618,) "and few," says a writer on this subject, "are the days in the history of the world that deserve so well to be remembered."

After the happy idea of comparing the powers of the distances and times, the step to the final result was extremely simple and easy; though it does not appear that Kepler employed any particular method for this purpose, but had recourse to various trials before the real law was discovered.

Suppose, for instance, D , d , and δ , to represent the distances of any three planets, and T , t , τ , the three corresponding times of periodic revolution; then, in order to ascertain whether any law subsists between these two series of quantities, let us assume the following proportions: *viz.*

$$\begin{aligned} D^n &: d^n :: T^n : t^n \\ D^n &: \delta^n :: T^n : \tau^n \end{aligned}$$

where m and n may represent any numbers whatever, either integral or fractional. Then

$$\begin{aligned} m \log. D + n \log. t &= m \log. d + n \log. T \\ m \log. D + n \log. \tau &= m \log. \delta + n \log. T \end{aligned}$$

$$\begin{aligned} m (\log. D - \log. d) &= n (\log. T - \log. t) \\ m (\log. D - \log. \delta) &= n (\log. T - \log. \tau) \end{aligned}$$

$$\begin{aligned} \text{or} \quad m \log. \frac{D}{d} &= n \log. \frac{T}{t} \\ m \log. \frac{D}{\delta} &= n \log. \frac{T}{\tau} \end{aligned}$$

Whence again,

$$\log. \frac{D}{d} \times \log. \frac{T}{\tau} = \log. \frac{D}{\delta} \times \log. \frac{T}{t}$$

which equality must necessarily obtain if any law subsist, and it is remarkable that it should be totally independent of the law itself. Therefore, it was only necessary to submit the above equality to examination, in order to be assured of the existence or non-existence of any analogy; and having thus ascertained that some law must have place, the law itself is readily discovered from any of the above equations. Thus

the equation $m \log. \frac{D}{d} = n \log. \frac{T}{t}$ gives immediately

$$\frac{n}{m} = \frac{\log. \frac{D}{d}}{\log. \frac{T}{t}}, \text{ which fraction being reduced to the lowest}$$

terms will furnish the particular values of m and n . As these formulæ are applicable to any two series of quantities, between which any law of this kind is suspected to obtain, they are not altogether unworthy of attention. We have thus given a slight sketch of the discoveries of this celebrated astronomer, which, had the limits of our article admitted of it, might have been extended to a much greater length; in the present instance, however, we can only refer the reader who wishes for more complete information on this interesting subject, to Dr. Small's "Account of the Astronomical Discoveries of Kepler."

KEPLER'S Problem. See PROBLEM.

KEPPEL, AUGUSTUS, in *Biography*, a celebrated English admiral, the second son of William, earl of Albemarle, was born April 2d, 1725. He entered the sea-service while he was young, accompanied commodore Anson round the world, and by the zeal which he manifested in his profession, was raised to the first honours which it had to bestow. The most important occurrence in his life took place in 1778, when he had the command of the channel fleet, to which he had been appointed at the personal and urgent solicitation of the king, and which he readily accepted, though he could not help observing, that "his forty years services were not marked by any favour from the crown, except that of its confidence in the time of danger." On the 12th of July he fell in with the French fleet, under count d'Orville, off Ushant: an engagement ensued, which, though partial, was very warm while it lasted. It was necessary to take a short time to repair the damages: which being done, the admiral made proper signals for the van and rear division to take their respective stations. This order was obeyed with great alacrity by sir Robert Harland of the van, but admiral sir Hugh Palliser of the rear took no notice of the signal, and refused to join his commander, till night prevented a renewal of the battle. The French, taking advantage of the darkness, escaped to their own coast. Admiral Keppel, willing to excuse

cuse sir Hugh Palliser, at least to screen him from public-resentment, wrote home such a letter as seemed even to imply great impropriety of behaviour in the commander himself. The conduct, however, of the rear-admiral was attacked in the public papers: he demanded of his commander a formal disavowal of the charges brought against him, which Keppel indignantly refused. He immediately exhibited articles of accusation against the commander-in-chief, for misconduct and neglect of duty, although he had a second time failed with him, and had never uttered a syllable to his prejudice. The lords of the admiralty, to the astonishment of the nation, instantly fixed a day for the trial of admiral Keppel: he was most honourably acquitted, and received the thanks of both houses of parliament for his services. Palliser was next tried, and escaped with a censure only, but the resentment of the public was so great, that he was obliged to resign several offices which he held under government, and to vacate his seat in parliament. The acquittal of Keppel was celebrated with the most magnificent illuminations, and other marks of rejoicing which had never been known at that time in this country, and the houses of lord Sandwich, first lord of the admiralty, and sir Hugh Palliser, were with difficulty saved from destruction; the windows and much of the furniture being demolished by the fury of the populace. In 1782, admiral Keppel was raised to a peerage, with the titles of viscount Keppel, baron Eldon: he was afterwards, at two different periods, appointed first lord of the admiralty. He died Oct. 3d, 1786, unmarried, and of course his titles became extinct. He was a thorough seaman, and a man of great integrity and humanity. *Gent. Mag.*

KEPPEL'S Bay, in *Geography*, a bay of the South Pacific ocean, on the N.E. coast of New Holland. S. lat. 23° 28'. E. long. 150° 33'.

KEPPEL'S Island, or *Traitor's Island*, an island in the South Pacific ocean. S. lat. 15° 53'. W. long. 172° 33' to 175° 13'.—Also, a small island on the N. side of the most westerly of the Falkland islands, in the S. Atlantic ocean. S. lat. 51° 24'. W. long. 60° 15'.—Also, one of those called queen Charlotte's islands, in the S. Pacific ocean. S. lat. 10° 15'. W. long. 134° 56'.

KEPPEL'S Islands, a group of islands near Keppel's bay, on the N.E. coast of New Holland, discovered by captain Cook in the year 1770. Near these islands the water, which was too shallow for fish, abounded with crabs, which were of two sorts, and both such as had not been seen before: one of them was adorned with the finest blue that can be imagined, in every respect equal to the ultramarine, with which all his claws and every joint were deeply tinged; the under part of it was white, and so exquisitely polished, that in colour and brightness it resembles the white of old China; the other was also marked with the ultramarine upon his joints and toes, but somewhat more sparingly, and his back was marked with three brown spots, which had a singular appearance. S. lat. 25° 8'. W. long. 209° 1'. Hawkefworth's *Voyages of Cook*, &c. vol. iii.

KEPSE, a town of Syria, on the coast of the Mediterranean, and on the N. side of the mouth of the Orontes, about a mile from the sea; situated, as it is supposed, on the site of the ancient *Seleucia*, which see.

KEPTA, a town of Bootan; 24 miles S. of Tassafudon.

KERAMIANS, a heretical sect of Mahometans, the followers of Mohammed Ebn Kerâm, called also Mojaſſemians, or Corporealists, who not only admitted a resemblance between God and created beings, but declared God to be corporeal. They were led to this notion by the literal acceptation of those passages in the Koran, which figuratively attribute

corporeal actions to God, and of the words of Mahomet; when he said, that God created man in *his own image*, and that himself had *felt the fingers of God*, which he laid on his back, to be *cold*.

KERAMO, in *Geography*, a town of Asiatic Turkey, in Natolia; 24 miles S.S.E. of Miletus.

KERANA, a long fort of trumpet: somewhat in form of a speaking-trumpet, used by the Persians.

To the sound of this, they add a confused noise of haut-boys, timbrels, drums, and other instruments, every evening at sun-set, and two hours after midnight.

KERATI, in *Geography*, a town of Asiatic Turkey, in Caramania; 26 miles N.W. of Beishebi.

KERATIA, a town of European Turkey, in Livadia; 24 miles S.S.E. of Athens.

KERATOPHYTUM, in *Natural History*, a species of *Gorgonia*; which see.

KERAUN, in *Geography*, a town of Hindoostan, in Lahore; 15 miles W.N.W. of Gujrat.

KERBEH, a town of Natolia; 44 miles N.E. of Ismid.

KERBOOZA, a town of Hindoostan, in Lahore; 32 miles S.E. of Attock.

KERCAL, a town of Africa, in Fez, on the coast of the Mediterranean; 45 miles E.S.E. of Tetuan.

KERCH, or *Kertsch*, a fortified town of Russia, in the province of Tauris, on the channel between the Black sea and the sea of Azoph. It was founded by a colony of Greeks from Miletus, and afterwards subdued by the kings of Bosphorus. In the year of Rome 689, it was taken by Mithridates, king of Pontus, who, in consequence of the rebellion of his son Pharnaces, was besieged in the castle, and at his own request put to death by an officer of the Gauls, who had forced the walls; 100 miles E.S.E. of Perekop. N. lat. 45° 16'. E. long. 36° 14'.

KERCHA, a town of Persia, in Chusistan; 30 miles N.W. of Sulter.

KERCKRING, THEODORE, in *Biography*, a celebrated physician, was a native of Amsterdam. He had attained the age of eighteen, when he began the study of the Latin language, under the tuition of Francis Van Ende, and soon afterwards applied himself to medicine with so much zeal and success, that he obtained a high reputation, both in the practice of the profession, and by his anatomical and chemical discoveries. He continued the exercise of his art at Amsterdam for several years, and married the daughter of his preceptor, before mentioned; after which he settled at Hamburg in the year 1678, where, after having for a long time held the appointment of resident from the grand duke of Tuscany, he died in November, 1693. Anatomy was the favourite subject of his researches, and he formed an anatomical museum, which was long an object of admiration, and the resort of the curious, who visited that city. His principal writings were likewise upon anatomical subjects; they are as follows: 1. "*Spicilegium Anatomicum, continens Observationum Anatomicarum rariorum Centuriam unam, necnon Osteogeniam Fœtum, in quâ, quid cuique officulo singulis accedat mensibus, quidque decedat & in eo per varia immutetur tempora, accuratissimè oculis subjicitur.*" Amst. 1670, 1673. 2. "*Anthropogeniæ ichnographia, sive, conformatio Fœtus ab ovo usque ad ossificationis principia, in Supplementum Osteogeniæ Fœtum.*" (Ibid. 1671.) In this work the development of the fœtus, at different periods of its age, is traced with great attention and minuteness. 3. "*Commentarius in Currum Triumphalem Antimonii Bas. Valentini.*" (Ibid. 1671.) This is chiefly a translation of Basil Valentine's work, from the

German to the Latin. A posthumous collection of his anatomical writings was published at Leyden in 1717, with the title of "Opera omnia Anatomica." Eloy. Dict.

KERCOLANG, in *Geography*, an island in the East Indian sea, about 80 miles in circumference, inhabited by Malays. N. lat. of the north extremity $4^{\circ} 28'$. E. long. $126^{\circ} 30'$.

KERDA, a town of Sweden, in the province of Smaland; 38 miles W.N.W. of Wexio.

KERDECAN, a town of Persia, in the province of Kerman; 22 miles N.W. of Sirgian.

KERDISTAN, a town of Persia, in Chufistan; 90 miles E.S.E. of Sufter.

KERDIZ, a town of Candahar, in Cabulistan; 70 miles E. of Ghizni.

KEREDGE, a town of Persia, in Irak; 15 miles S.W. of Sava.

KERELO, a town of Transylvania, on the Maros; 20 miles W.N.W. of Schesburg.

KEREMPIBURUN, called *Cape Crampe*, a cape on the N. coast of Natolia, on a neck of land which projects into the Black sea. N. lat. $42^{\circ} 45'$. E. long. $33^{\circ} 10'$.

KEREN, a town of Persia, in Irak; 45 miles W. of Kermansha.

KERESBANJA, a town of Transylvania; 44 miles S.S.W. of Colofvar. N. lat. $46^{\circ} 16'$. E. long. $22^{\circ} 25'$.

KERESOUN, a town of Turkish Armenia, at the mouth of a river of the same name, which runs into the Black sea, anciently a city of Pontus, called *Ceramus*; which see.

KERESZTUR, a town of Transylvania; 36 miles N. of Schesburg.

KERET, a town of Russia, in the government of Archangel, on the White sea; 148 miles S. of Kola.

KERETSKOI, a town of Russia, in the government of Archangel, on the White sea; 32 miles N. of Archangel.

KERF is the notch or slit that is made by the saw between two pieces of wood, when they are sawing asunder.

KERFE-KARUMFEL, in the *Materia Medica*, a name given by Avicenna, and others, to the wood of the clove-tree, as the wood of the cinnamon-tree was called *kerfe darfini*; and many others in the same manner.

KERGONG, in *Geography*, a town of Hindoostan, in Candahar; 45 miles S. of Indore.

KERGUELEN'S LAND, otherwise called the *Island of Desolation*, an island in the Southern Indian ocean, first discovered in 1772, and afterwards visited, in 1773, by M. de Kerguelen, who, in his second voyage, discovered some other small islands in its vicinity. Kerguelen has, since the death of captain Cook, published the journal of his proceedings in these two successive voyages, and has annexed to his narrative a chart of the coasts of this land, as far as he had explored them in both voyages. M. de Pagés, much about the same time, favoured the public with another account of the second voyage, in some respects fuller than Kerguelen's own, on board of whose ship he was then an officer. Captain Cook fell in with these islands in December 1776; and of the first he says, that it is an island of considerable height, and about three leagues in circuit. To this island Kerguelen had given the name of "Croy," or "Crouy;" and the view of it in his chart exactly corresponds with Cook's account of its being of considerable height. Cook observed another island of the same magnitude, one league to the eastward, which Kerguelen had called "Isle Rolland," after the name of his own ship, and of which he has given a view in his chart. Between these two islands Cook observed some smaller ones in the direction of S.E. In the direction S. by E. $\frac{1}{2}$ E. from

the E. end of the first island, a third high island was seen. This appears to have been Kerguelen's "Isle de Clugny," as marked on his chart. Another island in the N.E. direction was a high round rock, named by captain Cook "Bligh's Cap," which he justly concluded to be the same which M. de Kerguelen called the "Isle of Rendezvous," though Cook says "I know nothing that can rendezvous at it but fowls of the air; for it is certainly inaccessible to every other animal." Bligh's Cap was ascertained to be in S. lat. $48^{\circ} 29'$. E. long. $68^{\circ} 40'$. The French and English navigators agree very nearly with respect to the latitude of this island; but they differ as to its longitude. The pilot at Teneriffe made it only $64^{\circ} 57'$ E. from Paris, which is about $67^{\circ} 16'$ E. from London; or $1^{\circ} 24'$ more westerly than captain Cook's observations fix it. M. de Pagés says it is $66^{\circ} 47'$ E. from Paris, that is, $69^{\circ} 6'$ E. from London, or 26 miles more easterly than it is placed by captain Cook. Kerguelen himself only says, that it is about 68° E. long. The northern point of this land captain Cook erroneously concluded to be the "Cape Louis" of the first discoverers; whereas, by an inspection of Kerguelen's chart, this northern point described by Cook, is the same with that to which the French have given the name of "Cape François." The whole extent of coast lying between Cape Louis and Cape François, of which the French saw very little during their first visit in 1772, and which may be called the N.W. side of this land, they had it in their power to trace the position of in 1773; and they have assigned names to some of its bays, rivers, and promontories upon their chart. On the 25th of December (Christmas day), captain Cook anchored in the harbour from this circumstance denominated "Christmas Harbour," which see. On the 27th many of the ship's crew went on shore, and made excursions, in different directions, into the country, which they found barren and desolate in the highest degree. They brought with them a quart bottle, which was found fastened with wire to a projecting rock on the N. side of the harbour. This bottle contained a piece of parchment, with the following inscription: "Ludovico XV. Galliarum rege, et D. de Boynes regi a secretis ad res maritimas annis 1772 et 1773." Captain Cook, as a memorial of having been in this harbour, caused to be written on the other side of the parchment this inscription: "Naves Resolution et Discovery de Regis Magnæ Britannię, Decembris 1776." This parchment was put again into a bottle with a silver two-penny piece of 1772; and the bottle, having been covered with a leaden cap, was placed on a pile of stones erected for the purpose, upon a little eminence on the N. shore of the harbour, near the place where it was first found. The Christmas harbour of captain Cook is the same with the "Baie de l'Oiseau" of the French, and Cape François, and not Cape St. Louis, is the northern point of this land; and the account of the S. point of the harbour given by M. de Pagés and captain Cook remarkably agree. The land on both sides of the inlet is high, and it runs in W., and W.N.W. about two miles. Its breadth is $1\frac{1}{4}$ mile, for more than half its length; above which it is only half a mile. The depth of water is 45 fathoms at the entrance, and varies, in proceeding farther inward, from thirty to five and four fathoms. The shores are steep, and the bottom is every where a fine dark sand, except near the shore, where are beds of sea-weed. The head of the harbour lies open only to two points of the compass; and even these are covered by islands in the offing, so that no sea can fall in to hurt a ship. It is high water here at the full and change days, about 10 o'clock; and the tide rises and falls about four feet. Captain Cook explored this island, and other islands adjacent

to it, with a view of extending Kerguelen's discovery. After having anchored in another harbour, called "Port Palliser," and situated in S. lat. $49^{\circ} 3'$. E. long. $69^{\circ} 37'$, and finding no encouragement to continue his researches, captain Cook put to sea. The French discoverers, with some reason, imagined Cape François to be the projecting point of a southern continent. "The English have since proved that no such continent exists; and that the land in question is an island of no great extent, which, from its sterility," says captain Cook, "I should, with great propriety, call the 'Island of Desolation,'" but that I would not rob M. de Kerguelen of the honour of its bearing his name." Kerguelen now concurs with captain Cook as to its being an island; but he apprehends, that it is about 200 leagues in circuit; and he says, that he was acquainted with about 80 leagues of its coast. After all, it cannot but be remarked, that Kerguelen was peculiarly unfortunate, in having done so little to complete what he had begun. He discovered, indeed, a new land, but, in two expeditions to it, he could not once bring his ships to an anchor upon any part of its coasts. Captain Cook had either fewer difficulties with which to struggle, or was more successful in surmounting them. From the account of Mr. Anderson, surgeon to captain Cook, who lost no opportunity of searching the country in every direction, we make the following extract.

"Perhaps no place, hitherto discovered in either hemisphere, under the same parallel of latitude, affords so scanty a field for the naturalist as this barren spot. The verdure, which appears when at a little distance from the shore, would flatter one with the expectation of meeting with some herbage; but in this we were much deceived. For on landing, we saw that this lively colour was occasioned only by one small plant, not much unlike some sorts of saxifrage, which grows in large spreading tufts to a considerable way up the hills. It forms a surface of a pretty large texture, and grows on a kind of rotten turf, into which one sinks a foot or two at every step. This turf, dried, might, in cases of necessity, serve for fuel, and is the only thing we met with here that could possibly be applied to this use. There is another plant, plentifully enough scattered about the boggy declivities, which grows to near the height of two feet, and not much unlike a small cabbage, when it has shot into seeds. The leaves about the root are numerous, large, and rounded; narrower at the base, and ending in a small point. Those on the stalks are much smaller, oblong, and pointed. The stalks, which are often three or four, all rise separately from the root, and run into long cylindrical heads, composed of small flowers. It has not only the appearance, but the watery acrid taste of the antiscorbutic plants, and yet differs materially from the whole tribe; so that we looked upon it as a production entirely peculiar to the place. We ate it frequently raw, and found it almost like the New Zealand scurvy-grass. But it seemed to acquire a rank flavour by being boiled." In our gardens it might, by cultivation, so far improve as to be an excellent pot-herb. Two other small plants were found near the brooks and boggy places, which were eaten as salad; the one almost like garden cressies, and very fiery; and the other very mild. This last, though but small, is in itself a curiosity; having not only male and female, but what the botanists call androgynous plants. A coarse grass, which we cut down for the cattle, grows pretty plentifully in a few small spots about the sides of the harbour, with a smaller sort, which is rarer: and upon the flat ground, a sort of goose-grass, and another small plant much like it. In short, the whole catalogue of plants does not exceed sixteen or eighteen, including some sorts of moss,

and a beautiful species of lichen, which grows upon the rocks higher up than the rest of the vegetable productions. Nor is there even the least appearance of a shrub in the whole country. "Nature has been rather more bountiful in furnishing it with animals; though, strictly speaking, they are not inhabitants of the place, being all of the marine kind; and, in general, only using the land for breeding, and for a resting-place. The most considerable are seals, or (as we used to call them) sea-bears; being that sort called the urine seal. These come ashore to rest or breed; but they were not very numerous; which is not to be wondered at, as it is known, that these animals rather frequent out-rocks, and little islands lying off coasts, than bays or inlets. They were, at this time, shedding their hair, and so tame, that we killed what number we chose. No other quadruped, either of the sea or of the land kind, was seen; but a great number of birds, viz. ducks, petrels, albatrosses, shags, gulls, and sea-swallows." Penguins form by far the greatest number of birds here, and are of three sorts. The shags of this place are of two sorts; the lesser cormorant or water-crow, and another which is black above with a white belly; the same that is found in New Zealand, Terra del Fuego, and the island of Georgia. Another sort of white bird, flocks of which flew about the bay, is very singular; having the base of the bill covered with horny crust. It is larger than a pigeon, with the bill black and the feet white, made like those of a curlew. Some of the people put it in competition with the duck, as food. The seine was hauled once, but we found only a few fish about the size of a small haddock." "The only shell-fish are a few limpets and mussels, and, among the stones, a few small star-fish and sea-anemonies were found.

"The hills are of a moderate height; yet many of their tops were covered with snow at this time, though answering to our June. Some of them have large quantities of stone irregularly heaped together at their foot, or on their sides. The sides of others, which form steep cliffs towards the sea, are rent from the top downward, and seem ready to fall off, having stones of a considerable size lying in the fissures. Some were of opinion, that frost might be the cause of these fissures, which I shall not dispute; but how others of the appearances could be effected, but by earthquakes, or some such severe shocks, I cannot say."—"It appears that rain must be almost constant here, not only from the marks of large torrents having rushed down, but from the disposition of the country, which, even on the hills, is almost an entire bog or swamp, the ground sinking at every step. The rocks, or foundations of the hills, are composed chiefly of a dark blue, and very hard stone, intermixed with small particles of glimmer or quartz." "Another brownish brittle stone forms here some considerable rocks; and one which is blacker, and found in detached pieces, incloses bits of coarse quartz. A red, a dull yellow, and a purplish sandstone are also found in small pieces; and pretty large lumps of semi-transparent quartz, disposed irregularly in polyedral pyramidal crystals of long shining fibres. Some small pieces of the common sort are met with in the brooks, made round by attrition; but none hard enough to resist a file. Nor were any of the other stones acted on by aquafortis, or attracted by the magnet. Nothing, that had the least appearance of an ore or metal, was seen." S. lat. $49^{\circ} 20'$. E. long. $69^{\circ} 30'$. Cook's Third Voyage, vol. i.

KERI-CHEITIB, are various readings in the Hebrew bible: *keri* signifies that which is read; and *cheitib* that which is written. (See CHEITIB and KERI.) It is generally said by the Jewish writers, that these corrections were introduced by Ezra; but it is most probable that they had their original

original from the mistakes of the transcribers after the time of Ezra, and the observations and corrections of the Masorites. Those *keri-chetibs*, which are in the sacred books written by Ezra himself, or which were taken into the canon after his time, could not have been noticed by Ezra himself; and this affords a presumption, that the others are of late date. These words amount to about a thousand; and Dr. Kennicott, in his "*Dissertatio Generalis*," remarks, that all of them, excepting fourteen, have been found in the text of manuscripts.

KERJE, or EL KERDSJE, in *Geography*, a district of the province of Neged, or Nedsjed, in Arabia, lying on the S.W. part of this province, and of course on the frontiers of Yemen, extending along the east of Hedsjaz, or Hejaz, a considerable way to the N. In this district is the city of Imam, famous even before the days of Mahomet, for being the native city of Mozeilama, who set himself up as a prophet. This province also comprises other towns, among which is Salernia, on the confines of Yemen.

KERIGAR, a town of Hindoostan, in the soubah of Oude; 80 miles N. of Lucknow. N. lat. $28^{\circ} 12'$. E. long. $81^{\circ} 25'$.

KERIKERD, a town of Persia, in Chusistan, taken by Timur Bec in 1393; 15 miles N. of Susfer.

KERISONGAR, a town of Hindoostan, in Bahar; 24 miles E.S.E. of Hajypour.

KERION, a town of Thibet, 24 miles N.W. of Serangpour. N. lat. $32^{\circ} 35'$. E. long. 83° .

KERISONGAR, a lake of America, in the district of Maine, which sends its waters to Penobscot river.

KERIST, a town of Persia, in Faristan; 106 miles S.S.E. of Schiras.

KERKA, a town of Persia, in Chusistan; 45 miles W. of Toltar.

KERKELAN, a town of Asiatic Turkey, in the government of Sivas; 30 miles W.S.W. of Amalich.

KERKENI, a small island near the E. coast of Tunis. N. lat. $34^{\circ} 55'$. E. long. $11^{\circ} 12'$.

KERKER, a town of Asiatic Turkey, in Aladulia, on the Euphrates; 30 miles S. of Malatia.

KERKHA, a town of Persia, in Chusistan, on the Karafa; 15 miles N. of Susfer.

KERKHERDERE, JOHN GERARD, in *Biography*, a learned professor of the university of Louvain, was born in the neighbourhood of Maeltricht, about the year 1678. He pursued his academical studies at Louvain, and distinguished himself during several years for his accurate and comprehensive knowledge of history and the belles-lettres. In 1708, he was appointed historiographer to the emperor Joseph I., and died in the year 1738. He was author of many works in general history and theology, of which the principal are entitled "*De Monarchia Romæ Paganæ secundum Concordiam inter S. S. Prophetas Danielelem et Joannem, &c.*" and "*Prodromus Danieliens sive novi Conatus historici, critici, in celeberrimas difficultates Historiæ veteris Testamenti.*" These pieces are distinguished by profound erudition and great critical acumen, and are said to throw much light on many obscure passages in the scriptures relating to history, chronology, and geography. He published a Latin grammar, and a number of Latin poems.

KERKIL, or GUERIL, in *Geography*, a town of Curdistan; 35 miles S.S.E. of Amadich.

KERKISIA, or KERRISIEH, a town of Asiatic Turkey, in the province of Diarbekir, now decayed; eight miles N. of Rabba. N. lat. $35^{\circ} 18'$. E. long. $40^{\circ} 10'$.

KERKONI, a town of Georgia; 25 miles S.W. of Teflis.

KERKUK, a town of Curdistan, the capital of a government, and residence of a pacha; surrounded with walls and defended by a castle; 150 miles N. of Bagdad. N. lat. $35^{\circ} 59'$. E. long. $43^{\circ} 42'$.

KERKUYCK, a town of Holland, in the department of Guelderland; two miles S. Bommel.

KERL, JOHN GASPAR, in *Biography*, a native of Saxony, but having acquired in early youth great reputation as an organ player, he was called to Vienna by the archduke Leopold, and appointed organist at his court; and manifesting signs of extraordinary genius for composition, he was placed under Giovanni Valentini, maestro di cappella at the Imperial court, and afterwards sent to Rome to study under Carissimi. Upon his return to Germany, great offers were made to him from the elector palatine, if he would enter into his service; but he declined them, and preferred settling at Munich, where he became maestro di cappella to the elector of Bavaria, Ferdinando Maria. His principal work as a composer was his "*Modulatio organica super Magnificat Octo Tonis Ecclesiasticis Respondens*," engraved and published at Munich, in 1686. Kerl was esteemed one of the most able and skilful organists of his time. In a competition with some Italian musicians at the court of the elector of Bavaria, he is said by Walther to have composed a piece for the organ of wonderful contrivance, which none but himself could execute.

KERLE, JACOB DE, canon of the cathedral of Cambridge, from Ypres, was a very voluminous composer, contemporary with Gaspar. He published "*Pecces specialis successu*," in 1569; "*Casmen Italica musicis modulis ornata*," 1570; "*Cantiones sacras, 5 & 6 vocum*," 1571; in 4to. Venice, 1573, two, four, and five-part motetti, four and five-part masses, and a Te Deum.

KERLEH, in *Geography*, a circle of Hindoostan, in Berar, N.W. of Goondwana, and S.E. of Hindia and Bopaltol.

KERMAN, anciently *Caramania*, a province of Persia, bounded on the N. by Segellan, on the E. by Mekran, on the S. by the Persian gulf, and on the W. by Faristan and Laristan. The northern part is barren and almost desert, without rivers or brooks, and the air unhealthy; towards the S. the air is more pure, and the land fertile. This province contains a city of the same name (see SIRGIAN); but some authors represent Yezd as the capital. (See YEZD.) The Guebres in this province are numerous; and are chiefly employed in manufactures of stuffs and silk. Here are some mines of copper, lead, and iron. The great desert of Kerman joins with the Great Saline desert, by the Nauben Dejam, and extends about 350 miles. The Saline desert extends from the vicinity of Kom to that of the sea of Zurra, in a line from E. to W. of about 400 British miles; the breadth from N. to S. being about 250. These two extensive deserts may be considered as stretching N.W. and S.E. for a space of about 700 miles, by a medial breadth of about 200 (without including in the length other 200 miles of the desert of Mekran), thus intersecting the wide empire of Persia into two nearly equal portions. This vast extent is impregnated with nitre and other salts, which taint the neighbouring lakes and rivers.

KERMAN. See SIRGIAN.

KERMANA, a town of Hindoostan, in Onde; 40 miles E. of Bihraiteh.

KEMANSHER, a town of Persia, in the province of Kerman; 130 miles S.E. of Sirgian. N. lat. $28^{\circ} 20'$. E. long. $58^{\circ} 50'$.

KERMANTSCHUK, a town of Circassia, near which the

the Mogul Tartars were surpris'd by the Russians in 1783, and defeated with great loss.

KERMASIN, a town of Persia, in the province of Kerman; 160 miles S.E. of Sirjan.

KERMES, a kind of little animal, found in great plenty in many parts of Asia and the S. of Europe, on an evergreen of the oak kind, and forming excrescences, or *nidules*, of considerable use, both in physic and dyeing. That which was brought from Galatia and Armenia was formerly preferred; but at present it is chiefly gathered in Languedoc, Spain, and Portugal.

The kermes, called also *scarlet grain*, and by the Greeks *coccus baphica*, by the Latins *vermiculus*, by the French sometimes *vermilion*, or *grain de gal*, or *vermeil*, is about the size of a juniper-berry, round, smooth, and glossy; of a beautiful red colour, and full of a mucilaginous juice, of the same dye; it is found adhering to the bark on the stem and branches of a peculiar sort of scarlet oak. See *Coccus Ilicis*.

Kermes has been supposed to derive its name from an Arabic word, signifying a little worm, *vermiculus*, whence it has been called vermilion. Astruc deduces the name from two Celtic words, one of which signifies an oak, the other an acorn.

This insect hangs to the tree from which it is gathered by means of a cottony down, which, according to M. Chaptal, has many characteristics of the caoutchouc, being insoluble in alcohol, melting at the heat of boiling water, and burning with a flame on the coals. In Languedoc, about the middle of May, when this insect has attained to its proper size, and when in colour and shape it resembles a small fly, the harvest commences, and the peasants begin to gather it. This harvest continues till about the middle of June, or later, if the great heats be retarded, or no violent rains fall; for one heavy storm of rain puts an end to the gathering for that year. The persons employed in this business are women, who set out early in the morning, with a lantern and a glazed earthen pot, so as to pick off the kermes from the branches before day, which is the most favourable time for this business. A single person may gather from one to two pounds a day. At the commencement of the harvest, the kermes weighs more, but fetches a less price than at the end, when it is drier and lighter.

According as the winter has been more or less mild, the harvest of kermes is the more or less plentiful; and the people always presage themselves a fine season, when the spring has been free from frosts and fogs. It is observed, that the lowest and oldest shrubs are always the fullest of this insect; and the kermes produced on those trees, which are in the neighbourhood of the sea, is always larger and finer than from the inland places.

It is no uncommon thing to have two harvests of kermes in a year. Those of the latter season are smaller and less valuable than those of the first, and are found not on the branches, but on the leaves of the shrub; which is just analogous to the custom of the gall-insects of all other kinds; all which, about this age, leave the branches to feed on the leaves, where their yet tender trunks can find an easier entrance.

From this analogy between the kermes, and other insects of the same class, it should seem worth while to try, whether some of those may not possess the same virtues in medicine, at least, if not in the arts. It is certain that the common oak produces a red-gall insect of the very shape of the kermes, and of the colour of the paler ones. Reaumur. See the article *Coccus*.

The kermes is of a vinous smell, a bitter, rough, and pun-

gent taste; and its pulp, or juice, is pregnant with numerous minute ova.

The animal retains these ova under her belly, till they hatch into a very numerous offspring.

Hence, when the kermes is dried, there comes out of it an infinite number of little insects, and flies, so small, that they are scarcely visible; inasmuch, that the whole inward substance seems converted into them. This shell is nothing but the body of the mother, distended by the growth of the eggs. To prevent this inconvenience, they usually steep the kermes in vinegar before it be dry; and thus prevent the exclusion of the ova, and kill such animals as are already hatched. It is afterwards dried on linen cloths. This operation gives it a colour like that of red wine. They draw the juice, or pulp, from the kermes, by pounding it in a mortar, and then straining it through a sieve: of this they make a syrup, by adding a sufficient quantity of sugar. Sometimes they dry the pulp separate from the husk; which pulp, thus dried, they call *passel of kermes*. If the living insect be bruised, it gives out a red colour.

The kermes was formerly of great use in physic: esteemed to be cardiac, desiccative, and astringent; to fortify the stomach, and prevent abortion. Of this was made that celebrated confection called *alkermes*.

The restringent and corroborant confection that was sold in the shops, was prepared by dissolving, in the heat of a water-bath, six ounces of fine sugar, in six ounces, by measure, of damask rose-water; then adding three ounces of the juice of kermes, warmed and strained; and after the whole had grown cold, mixing half a scruple of oil of cinnamon. This confection was taken, from a scruple to a dram, or more, either by itself, or in juleps, with which it mingles uniformly, without injuring their transparency.

The dried grains of kermes, if they have not been too long kept, give out, both to water and to rectified spirit, the same deep red colour, and nearly the same kind of smell and taste with those of the expressed juice. The inspissated extracts are considerably bitter, astringent, and of a kind of mild balsamic pungency.

It is, however, of greater use in dyeing scarlet; for which use, the manner of preparing it is as follows: the kermes being taken when ripe, they spread it on linen; and at first, while it abounds most in moisture, turn it twice or thrice a day, to prevent its heating, till such time as there appears a red powder among it: this they separate, by passing it through a sieve, and then again spread abroad the grain on the linen, till they perceive the same redness of powder, when they repeat the sifting: thus they proceed, while they discover any red powder on the surface of the grain, which is still passing through the searce, till it yield no more.

In the beginning, when the small red grains are found to move, as they will always do, they are sprinkled over with strong vinegar, and rubbed between the hands. Were not this precaution taken, out of every grain would be formed little insects, which would be of no use in dyeing.

The grain being quite emptied of its pulp, or red powder, by the process above-mentioned, is washed in wine, and then exposed to the sun; after this, it is put up into the husks, formed into balls, and along with it the proportion of red dust that it had afforded.

According to M. Marfigli's experiments, made at Montpellier, the kermes has the effect of galls, when mixed with vitriol; and makes a good ink: mixed with oil of tartar, or lime-water, its colour turns from a vermilion to a crimson colour. In a decoction of turnsol flowers, it retains its proper colour. They have not been able to get any fixed essential salt from it; but a volatile salt it yields in abundance;

abundance; which, in M. Marfigli's opinion, would have a better effect in medicine, if taken in a liquid, than when enclosed in conferves and confections, which hinder its action.

Woollen cloth, prepared with alum and tartar, acquires, on being boiled with dry kermes berries, a durable deep red colour, called *scarlet in grain*, from the kermes having been formerly supposed to be the grain or seed of the tree; and *Venice scarlet*, from the greatest quantities having been dyed there. This colour wants the lustre and fire of the cochineal scarlet now in vogue, but in return is far more permanent, nor subject to be itained by dirt, or acrid liquors; and when spotted with grease, may be cleaned again without injury to the colour.

Mr. Hellot observes, that the figured cloths to be seen in the old tapestries of Brussels, and the other manufactures of Flanders, which have scarcely lost any thing of their liveliness in standing for two hundred years, were all dyed with this ingredient; that, nevertheless, kermes is at present entirely in disuse among the European dyers, though said to be commonly employed in the Levant, and exported thither from Marseilles in considerable quantities: that when the kermes scarlet (now called an ox-blood colour) is wanted for tapestries, &c. our dyers endeavour to imitate it with cochineal; that as the colour is difficultly hit with cochineal alone, they generally add a portion of Brazil wood; and that the dyes thus produced, though at first more vivid than they ought to be, often lose their lustre before a year is at an end, and turn white and grey in an extraordinary manner: that kermes might again be introduced to very good advantage, as its colour is of the most durable kind, and as sundry shades are obtainable from it with less trouble and expence than from other drugs.

The same author has given a great number of experiments upon kermes, with different salts and metallic solutions. The principal of these are as follow:

On adding to the decoction of kermes a small quantity of solution of tin, the dark colour of the liquor is immediately brightened, and prepared woollen dyed therein, inclines more to the orange than with the kermes alone. With this improvement of the colour, it receives the imperfections, though not all the beauty of the cochineal scarlet; all alkaliescent substances staining the cloth, that is, destroying the effect of the acid solution.

Kermes, with cream of tartar, and as much of the solution of tin as is employed for the cochineal scarlet (without any alum) dyed unprepared cloth of an extremely vivid cinnamon colour. On dipping the cloth in a solution of alum, a part of the red re-appeared, but was not beautiful.

With cream of tartar, solution of tin, and alum in larger quantity than the tartar, this drug gives purplish colours, which vary according to the proportions of the ingredients.

If vitriolated tartar be substituted to the alum and tartar; and if after the kermes has been boiled in a solution of a small quantity of this salt, the stuff be boiled in this mixture for about an hour, the dye proves a beautiful kind of grey, in which the red is little perceived.

Glauber's salt, employed along with kermes, entirely destroys its redness, and gives an earthy grey colour. This dye is very perishable, on account of the particular nature of the saline substance, by means of which the tinging particles are applied; for Glauber's salt dissolves easily in cold water, and falls into a powder in the sun's heat. This obtains equally in all dyes; those drugs which afford most durable colours with tartar and vitriolated tartar, give

very perishable ones with the more dissoluble and calcinable salts.

Green and blue vitriol, substituted separately to alum, but taken in conjunction with cream of tartar, destroy likewise, or conceal the red colour of kermes, which in these two experiments has the same effect with galls, for it precipitates the iron of the green vitriol which tinges the cloth of a bright grey, and the copper of the blue, which gives a kind of olive dye. It likewise gave an olive dye with solution of copper made in aquafortis; a certain mark, that it possesses, like galls, an astringent precipitating quality. It is probably the astringency of kermes that renders its dye so durable; for all the barks, woods, roots, and other substances that are astringent, yield permanent colours.

White vitriol, employed with crystals of tartar, changes the red colour of kermes into a violet. A tincture of bismuth ore, in spirit of nitre, and a solution of bismuth itself made leisurely in four times its weight of spirit of nitre, diluted with an equal quantity of water, gave also a violet dye upon white cloth. All acids convert it to a cinnamon colour, which inclines more or less to red, according as the acids are weak, and their quantity small. Alkalies render its colour dull and dry. See Neumann's Chemistry, by Lewis, p. 508, &c.

To dye spun worsted with kermes, it is first boiled half an hour in water with bran; then two hours, in a fresh bath, with one-fifth of Roman alum, and one-tenth of tartar, to which four water is commonly added: after which it is taken out, tied up in a linen bag, and carried to a cool place, where it is left some days to obtain a full colour. As much kermes as equals three-fourths, or even the whole of the weight of the wool, is put into a warm bath, and the wool is put in at the first boiling. As cloth is more dense than wool, either spun or in the fleece, it requires one-fourth less of the salts in the boiling, and of kermes in the bath. Less proportions of kermes will produce lighter and paler colours. If a succession of shades be wanted, we must, as usual, begin with the deepest. Hellot directs a small handful of cot or refuse wool to be thrown into the boiler in which the kermes is, and to let it boil a moment before the wool to be dyed is put in. This will absorb a kind of black dregs, and the wool afterwards dipped will take a better colour. Before the wool that is just dyed is taken to the river, it may be dipped in a bath of water a little warm, in which a small quantity of soap has been dissolved. In this way the colour will acquire more brightness, though it will be rendered a little rosy, that is, will have a crimson cast. The colour imparted by kermes to wool, has much less bloom than the scarlet made with cochineal; whence the latter has been generally preferred, since the art of heightening its colour by means of solution of tin has been known. Berthollet.

KERMES Mineral, or, in modern language, the hydro-sulphuret of antimony. The kermes mineral was a preparation of Glauber, which the king of France bought of M. de la Ligerie, and made public in 1720. That receipt was in the following form: take a pound of Hungarian antimony, broken into thin pieces, according to the direction of its spicula; four ounces of nitre, fixed by charcoal; and a pint of rain water; boil them two hours; then filter the warm liquor, and when it cools, the kermes precipitates. The same antimony undergoes the same operations with the remaining liquor, to which three ounces of fixed nitre, and a pint of water are added. In a third boiling, two ounces of nitre, and a pint of water are to be added to the former lixivium. The kermes thus obtained is about a dram, and is well edulcorated by washing it with water, and burning spirit of wine on it; then it is dried for use.

Mr.

Mr. Geoffroy shews, by many experiments, that the kermes is the reguline part of the antimony, joined to a fort of hepar sulphuris. He teaches us a much easier way of preparing this medicine, thus: Mix intimately the fine powder of two parts of antimony, and one of any fixed alkaline salt; melt those metals in a crucible; then having powdered them while hot, boil them two hours in a large quantity of water; after this, pass the hot liquor through paper, receiving it into a vessel, in which there is hot water, the kermes separates when it cools. The grosser parts, which do not pass through the paper, are to be boiled again, and filtrated as before; and the operation is to be repeated a third time, by which six or seven drams of kermes may be got out of every ounce of antimony. He says, he has seen effects like to those of mild kermes from antimony, reduced to such a fine powder, that none of the shining spicula are to be seen; and that the magistery of antimony, made by pouring spirit of nitre, or aqua regia, on the powder of antimony, and then edulcorating the mass with water, has the same effects as kermes. Mem. de l'Acad. des Sciences, 1734, 1735. For the modern method of preparing it, see ANTIMONY.

Half a grain, or a grain of this powder, given every three or four hours, produces no violent effects; but by increasing the dose, it may be made to vomit, purge, and sweat.

When seven or eight grains are taken at once, it chiefly acts upon the primæ viæ, generally as an emetic and purgative. A dose of three or four grains is seldom emetic, and more frequently purgative. When taken in these quantities as an evacuant, a little of it passes also into the viæ secundæ & tertiæ. When it is administered in smaller doses, it passes almost entirely into the lacteal blood and lymphatic vessels. In these it occasions such spasms and oscillations as it does in the primæ viæ; so that it increases all secretions and excretions, but particularly those of urine, sweat, and expectoration; according to the dose, the nature of the disease, and the disposition of the patient. It produces singularly good effects in those diseases of the breast which proceed from fulness and obstruction. It may be administered in any vehicle, or incorporated in a bolus, with other suitable remedies. But it should never be joined with acids, when it is designed to act as kermes.

Some commend this medicine as the most universal resolvent and deobstruent; assuring us, that it almost infallibly cures pleuritis, peripneumonies, asthmas, catarrhs, angina, small-pox, and many other diseases. Others are as positive, that it heats and thickens the blood, thereby increasing obstructions, and is particularly hurtful in all inflammatory diseases.

This preparation was famous in France, and known by the name of *poudre des Chartreux*, because a Carthusian monk, who got it from M. de la Ligerie, first brought it into vogue. See Hist. de l'Acad. des Sciences 1720, and the Memoirs for the same year, where it is said that Glauber was looked upon as the first inventor of this remedy. Its effects, like those of many other antimonial preparations, are very various, which is frequently owing, as Mr. Geoffroy observes, to the different manner and care in making it. He adds that the more the kermes contains of a regulus easily revived, the more it proves emetic. He also shews how to make a cinnabar with the kermes and mercury, and so disengage the vitriolic acid from the kermes. See Mem. de l'Acad. des Sciences, 1734. This preparation of antimony is now disused; and in its room the pharminacopeias have adopted the "Sulphur antimonii præcipitatum vel auratum;" for the method of preparing and administering which, see ANTIMONY.

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KERMISE, in *Geography*, a town of Arabia, in the province of Nedsjed; 65 miles S.S.E. of Jamama.

KERN, or KERNE, a term in the ancient Irish militia, signifying a *foot-soldier*.

Camden tells us, the armies of Ireland consisted of cavalry, called *galloglasses*; and infantry, lightly armed, called *kernes*. The kernes bore swords and darts; to the last were fitted cords, by which they could recover them after they had been launched out.

KERN, in the *English Salt-works*, a word used to signify the crystallizing, or shooting of salt in the brine, when sufficiently evaporated in the boiling pan.

This word is also used by the seamen for the first coming of the bay-salt, made by the sun's heat in the isles of May, &c. See SALT.

KERN-stone, in *Natural History*, a name given by the common people of many parts of England, to a peculiar sort of stone, which is found on the sides of hills in sandy countries, where the hills are rocky. Pyran sands afford a great many stones of this kind; and the manner of their formation is thus: the rocks in the sides of the hills are continually covered over with the loose sand, which the winds toss up, and the sparry matter continually oozing out of the pores of these stones, with the wet, cements the grain of sand together. When one crust is thus formed, another is soon added, and so on till the whole mass is of a considerable thickness; and the spar still serving as a general cement, the whole is held together, though but in a loose way, yet so as to resemble a sort of stone. The little grains of sand are still visible in all parts of this stone, and are what induced the people to call it kern-stone, as they call these *kerns*, or *kernels*. This account of the origin of the stone is easily proved, by putting a small piece of it into aquafortis, for this dissolves the spar, or cement, and the sand is left loose.

KERNES, in our *Laws*, signify idle persons, or vagabonds.

KERNING, in *Letter-Foundry*. See LETTER FOUNDRY.

KERONA, in *Geography*, a town of Hindoostan, in the circar of Gohud; 15 miles N. of Datteah.

KEROWLY, a town of Hindoostan, in the country of Agra; 74 miles S.W. of Agra. N. lat. 26° 27'. E. long. 77° 28'.

KERPEN, a town of France, in the department of the Roer, and chief place of a canton, in the district of Cologne; 10 miles E.S.E. of Juliers. N. lat. 50° 25'. E. long. 6° 41'. The place contains 1515, and the canton 10,419 inhabitants, in 37 communes.

KERRAH, a town of Hindoostan, in Guzerat, on the gulf of Cambay; 65 miles S.S.W. of Gogo.

KERRERA, one of the smaller western islands of Scotland, near the coast of Argyle, where, in 1249, Alexander II. died, when he was endeavouring to wrest the islands out of the possession of the Norwegians; 12 miles S. of Lismore. N. lat. 56° 23'. W. long. 5° 32'.

KERRI, a town of the Arabian Irak, at the conflux of the Tigris and Euphrates; 50 miles N.W. of Bassorah.

KERROO, a town of Hindoostan, in Vishapour; 12 miles N.W. of Baddammy.

KERRY, a county of the province of Munster, Ireland, situated on the south-western coast of the island. It is bounded on the north by the river Shannon, which divides it from the county of Clare; on the east by the counties of Limerick and Cork; on the south-east by the latter county; and on the south-west and west by the Atlantic ocean. Its form is very irregular in consequence of two great projecting tongues of land, comprising the baronies of Iveragh and Corcaguiny.

Corcaguinny. It extends from north to south $53\frac{1}{2}$ (67½ English) miles, and in the broadest part from east to west 41 (52 English) miles; and contains 1012 square miles, or 647,650 Irish acres, equal to 1,040,487 English acres. It thus appears to be the fifth county of Ireland in point of extent, though after Galway its population is the thinnest, and it is one of the most backward in point of culture. The number of houses, at the time Dr. Beaufort wrote, was, by return to the house of commons, 19,395, which at $5\frac{1}{2}$ to a house, would be 107,000. This, however, falls much short of the present population. The number of parishes is 83, all in the diocese of Ardferd and Aghadoe, but by unions they are reduced to 40 benefices, in which are 20 churches and only three glebe houses. Indeed, in this county the number of Roman Catholics is greater, in proportion to that of Protestants, than in almost any other. The number of members which represent this county in the Imperial parliament is three, two knights of the shire, and one member for the borough of Tralee. "It is not surprising," says Dr. Beaufort, "that this county should be thinly inhabited; barren mountains, and almost inaccessible rocks, render a large portion of it unfit for habitation, and incapable of culture. Even the northern baronies, in which there is much good land, with few mountains, are far from level; and the cheerful aspect of cultivated fields and fine pastures, is frequently interrupted by bleak and stony hills; while tracts of bog intersect the narrow plain that extends from Castlemain harbour to the borders of the county of Cork, between the Mang and the Flesk. Grazing is more attended to than tillage, and this part of Kerry supplies many fat beasts of good size, and great numbers of store cattle; but the native breed of the country is extremely small, yet remarkably good for the pail, resembling the Alderney cow both in size and character; butter is consequently a considerable article among the exports of Kerry. The barony of Corcaguinny forms a peninsula between the bays of Dingle and Tralee, and terminates at Dunmore Head, the most western point of Ireland and of Europe. It is full of mountains, but the high promontory of St. Brandon is eminent above the rest, and the mountain of Cahircouree stands across the isthmus. Among the rough and high hills in the barony of Iveragh, and the southern part of Dunkerron, some pleasant vallies and improveable grounds are interspersed; and in the island of Valentia, there are more inhabitants and a better culture than could be expected in so remote a spot. Glanerought is entirely covered with exceeding high and rugged hills, and separated from the county of Cork by an immense and almost impassable ridge of rocky mountains; over which there is but one pass, and that very difficult, called the Priest's Leap; but the loftiest mountains in this county stand in a huge assemblage on the west and south of Killarney, half encompassing the lower, and entirely surrounding the upper lake. Of these, Mangerton is generally esteemed the highest, being 2500 feet above the sea, but it is doubted whether the craggy summits of Macgillicuddy's rocks do not surpass it in altitude. In this desolate tract, there are large herds of red deer, and abundance of game." To this account of Dr. Beaufort's, published almost 20 years ago, there is very little to be added. The state of agriculture is still very low, though a few gentlemen have turned their attention to the improvement of it. The barony of Iveragh, in particular, is in a very rude state. It should be noticed that the horses of Iveragh are much esteemed; they are a small but an excellent breed, climbing over the most rugged rocks, and both ascending and descending the steepest precipices with great facility and safety. They are strong and durable, easily supported, and not ill-shaped; so hardy

as to stand abroad all winter, and will browse upon heath, furze, and other shrubs; and they have an easy, ambling gait. The principal lake is Lough Lane, generally called the lake of Killarney, for an account of which, see KILLARNEY. Many fine rivers water this county. The Cashing, which is formed by the union of the Fecla and the Gale, is navigable for eight or ten miles. The Lane flows out of the lake of Killarney, which receives the Flesk. The Roughy pours its impetuous current into Kenmare river. The Mang, which is navigable to Castlemain, was the northern boundary of the ancient counts palatine of Desmond, and falls into Castlemain harbour, at the bottom of the great bay of Dingle, which can only admit vessels of moderate burden. Ventry bay, the roads of Dingle and Valentia, and Ballynaskellig's bay, are small but commodious harbours. Kenmare river is a secure and capacious haven. The principal towns are Tralee, where the assizes are held, Killarney, Milltown, and Dingle, for which see the respective articles under those names. This county has several marble and slate quarries, and is not destitute of coal mines, but the abundance and cheapness of turf render them useless. The mines of copper, lead, &c. near Killarney will be noted under that head; iron was formerly obtained in great quantity, till the scarcity of timber put a stop to the works. The cider of Kerry, which is made of the cockagee apple, is highly prized, and brings a great price; yet orchards are not very numerous, and that valuable fruit, with another excellent apple, the Kerry pippin, are little propagated, and difficult to be procured. The original possessors of this county were the O'Connors, O'Sullivans, and, above all, the McCarthys, who were kings of Munster. The English families of Fitzmaurice and Fitzgerald early obtained settlements in it, and the head of the latter, who was created earl of Desmond, had the part of the county south of the Mang erected into a county palatine. The power of this family became very great, and the earls were often in opposition to the English government. In queen Elizabeth's time an act of attainder was passed, and all the possessions of the house of Desmond were divided amongst English settlers. From these some of the principal Protestant families are descended. Beaufort's Memoir of a Map of Ireland. Smith's History of Kerry.

KERRY Head, a cape of Ireland, in the county of Kerry, at the south extremity of the mouth of the river Shannon. Near this, very fine quartz crystals, both white, and amethyst are found, and for some time the latter were in great request. A set of ear-rings, a necklace, and other jewels composed of these amethysts, were presented to queen Caroline. This cape is in N. lat. $52^{\circ} 24'$. W. long. $9^{\circ} 47'$. This cape is sometimes called Ballyheigh Head. Smith. Beaufort.

KERRY Point, or, according to M^r Kenzie, Kenry, a cape of the county of Down, Ireland. N. lat. $54^{\circ} 22'$. W. long. $5^{\circ} 22'$.

KERS, a town of Tyrol, on the river Inn; 12 miles N.E. of Landeck.

KERSCHAN, a town of Istria; 16 miles N.N.E. of Pedenà.

KERSEY, JOHN, in *Biography*, an able mathematician and philologist, who flourished towards the close of the seventeenth, and beginning of the eighteenth centuries, and is chiefly known in the scientific world by his "Elements of Algebra," in two vols. folio, which is an ample and complete work, containing a full explanation of the problems of Diophantus: he was author likewise of "Dictionarium Anglo-Britannicum, or General English Dictionary."

KERSEY, a kind of coarse woollen cloth, made chiefly in Kent and Devonshire.

KERSHAW, in *Geography*, a district of South Carolina, on Wateree river, which separates it from Richland district; 35 miles long, and 30 broad, containing 7340 inhabitants, of whom 2530 are slaves.

KERUA, a town of Persia, in the province of Kerman; 90 miles S.S.W. of Sirgian.

KERVIKER, a town of Natolia; 28 miles S.W. of Aphiom-kara-lissar.

KERUN, a lake of Egypt, in a district forming a kind of excrescence to the west, about 30 miles long, and six broad; which has no appearance of being artificial.

KERYE', a town of Hindoostan, in Baglana; 25 miles W. of Nassuck.

KESALAX, a town of Sweden, in the government of Kuopio; 84 miles S.S.E. of Kuopio.

KESAVA, in *Mythology*, a name of the Hindoo deity Vishnu; and of his principal avatara or incarnation of Krishna, and is said to refer to the beauty of his hair. The name is also written Kefavi, and sometimes pronounced Kessu. Budha, or Vishnu in that avatara, is also sometimes addressed as Kesava.

KESAW, in *Geography*, a town of Hindoostan, in Bahar; 48 miles S.S.W. of Patna.

KESBAH, a town of Bengal; 23 miles S.S.E. of Moorshedabad.

KESCHIM, or KESEM, a sea-port town of Arabia, in the province of Hadramaut, and the residence of a sovereign prince. Its inhabitants are said to be highly civilized, and to receive all strangers hospitably. The English sometimes visit this harbour. The scheick of Keschim is sometimes called king of Fartak; and his dominions comprehend a considerable number of cities, among which is that of Fartak. Besides his possessions on the continent, the scheick of Keschim is likewise head of the island of Soccatra, famous for its aloes. N. lat. 15° 20'. E. long. 50° 2'.

KESELBAUDEN, a town of Bohemia, in the circle of Koniggratz; 18 miles N.N.E. of Gitschin.

KESELDORF, a town of Bohemia, in the circle of Koniggratz; 10 miles E. of Gitschin.

KESH, KESH, or Sebz, a town of Grand Bucharía, and capital of a district, of which Timur Bec was governor in 1360. This town was famous on account of its university for the study of sciences and law. It was the ordinary summer residence of Timur, and declared by him to be the second seat of his empire: he encompassed it with walls, and built a new palace in 1379. It was also called "Chaber-Sebz," or the green city, from the verdure of the gardens and meadows celebrated for rare and beautiful plants; and also "Coubbet Elilmi Veladeb," which signifies the dome of science and virtue; 30 miles S. of Samarcand. N. lat. 39° 10'. E. long. 64° 10'.

KESHAM, a town of Grand Bucharía; 70 miles W.S.W. of Badakhán.

KESHIK-DAG. See OLYMPUS.

KESHO, KESHO, or Kacho, a city of Asia, capital of the kingdom of Tonquin and the royal residence, is situated upon the navigable river Songkoy, or San Koy, about 40 leagues from the sea, and about 21° N. lat. With regard to size it may be compared with the most celebrated cities of Asia, and may at least equal that of Paris. On the 1st and 15th days of every moon are held great markets, which attract most of the inhabitants of the surrounding towns and villages to a considerable distance. The crowd is there so immense, that, though the streets be very wide, it becomes difficult to advance 100 paces in half an hour. Yet great order prevails, each merchandize and village having distinct streets for the

exposure of their articles. The streets are paved with brick, except some parts which are left for the passage of horses, elephants, and the king's carriages. Two-thirds of the houses are of wood, others of brick, among which are the factories of foreign merchants, distinguished amidst a multitude of huts constructed of bamboos and clay. The palaces of the Mandarins, and the public buildings, which occupy large spaces of ground, are chiefly built with wood in a neat and solid manner, and decorated with sculptures and paintings. The roofs consist of tiles of different colours. The common houses are composed of a roof placed on wooden columns, commonly covered with straw, reeds, or large leaves of trees, which, accidents excepted, will last 30 or 40 years. These houses have no ceilings or stories, but are divided by partitions, on a ground floor; and the numerous windows are covered with gauze, or fine muslin, glass being almost unknown. This construction being very liable to take fire, the police only permits it to be lighted during certain hours of the day. The trade is very considerable; and the great river is crowded with barks and boats, conveying the merchandize of the provinces to the capital. Each boat pays about two-pence for the right of anchorage, and this small tax forms a considerable revenue. The royal palace occupies a considerable space in the finest quarter of the city, situated amidst groves, gardens, and canals, and difficult of access. The women and eunuchs never quit its precincts. Before a recent revolution, the triple walls of the ancient city and palace, the courts paved with marble, and other features of grandeur, displayed one of the most beautiful and vast edifices of Asia; for the circumference of the palace and gardens is said to have been from six to seven French miles. At present the capital is only defended by a quick hedge of bamboos. In the neighbourhood is quartered a body of soldiery; the arsenal and other magazines of ammunition being on the banks of the river. On the other side is the Chinese town, established by precaution; nor are other strangers allowed to enter the city without a special permission. Abbé Richard cited in Pinkerton's *Geography*, vol. ii.

KESI, in *Hindoo Mythology*, a monster slain by Vishnu, or Krishna.

KESIRMAK, in *Geography*, a town of Poland, in the palatinate of Braclaw, near the Dneister; 72 miles S. of Braclaw.

KESITAH. This word is to be met with in Genesis, and in Job; and is translated in the Septuagint and Vulgate, sheep or lambs. But the Rabbins and modern interpreters are generally of opinion, that Kesitah signifies rather a piece of money. Bochart and Eugubinus are of opinion the Septuagint meant *mina*, and not *lambs*; in Greek *hecaton monon*, *εκατον μονον*, instead of *εκατον αρων*. Now a *mina* was worth sixty Hebrew shekels, and consequently six pounds sixteen shillings and ten-pence halfpenny sterling; or nine pounds English, supposing, as Dr. Prideaux does, that a shekel is worth three shillings. M. de Pelletier of Rouen is of opinion, that Kesitah was a Persian coin, stamped on one side with an archer, (*Kesitah*, or *Keseth*, in Hebrew signifying *a bow*,) and on the other with a lamb; that this was a gold coin known in the East by the name of a Daric, and was in value about twelve livres and ten-pence French money. A Daric is a piece of gold, worth, as Dr. Prideaux says, five and twenty shillings English. Several learned men, without mentioning the value of the Kesitah, say it was a silver coin, the impression whereof was a sheep; for which reason the Septuagint and Vulgate translate it by this name. Calmet is of opinion, that Kesitah was a purse of gold, or silver. In the East they reckon at present by purses: a purse in Persia consisting of 50 toman, which make 2518 penny

pieces of French money. The word *kifla* in Chaldee signifies a measure, or vessel. And Eustathius says that *kifla* is a Persian measure. Jonathian and the Targum of Jerusalem translate *Kesitala*, a pearl. Gen. xxxiii. 19. Job, xlii. 11. See his Connect. P. I. p. 101. See Calmet Comment. upon Gen. xxxiii. 19. Gen. xxv. 12. Job, xlii. 2, &c. and Dict. Bibl.

KESKER, or KURAB, in *Geography*, a town of Persia, in the province of Ghilan, on the coast of the Caspian sea; 25 miles N.W. of Reshd.

KESOCOTTY, a town of Thibet; 40 miles S. of Gangotri.

KESON, a town of Hindoostan, in Lahore; 25 miles E.N.E. Jullindar.

KESSELDORF, a town of Saxony, in the margraviate of Meissen; seven miles W. of Dresden.

KESTEN, a town of Syria; 25 miles W. of Aleppo.

KESTENUS, a town of Asiatic Turkey, in Natolia; 20 miles S. of Amasieh.

KESTREL, the English name of a hawk, called also the *flannel* and the *windhover*, and by authors the *tinunculus* and *ceneris*. It builds with us in hollow oaks, and feeds on partridges and other birds.

KESWICK, in *Geography*, a market town in the ward of Allerdale, in the county of Cumberland, England, is situated near the lower end of Derwentwater, on the eastern side of the extensive and beautiful vale of Keswick. The town consists of one long street: the houses are of stone, and were returned under the late population act at 290; the number of inhabitants 1350. A cotton factory has lately been established here; coarse woollen goods, carpets, blankets, kerseys, and some linens are also manufactured in the town and its vicinity. The chief trade is derived from the influx of travellers visiting the lakes: by whom Keswick, from its central situation, is much frequented; the number in one season, the summer of 1793, amounting to 1540. A weekly market is held on Saturdays; and a fair for cattle every fortnight from May to October. In this town two museums, collected by private persons, are open for public inspection; they contain specimens of almost every variety of the mineralogical substances of Cumberland, with many kinds of fossils, plants, antiques, and other curiosities. Keswick is distant from London 291 miles.

About two miles to the south of the town, on an eminence called Castle Rigg, is a Druidical arrangement of stones, some standing upright, some fallen, and others leaning obliquely: the whole number is fifty; of which forty are disposed in an oval form, thirty paces by thirty-two in diameter; the other ten compose a recess or long square within the area on the east side, in conjunction with the stones of the oval; this is seven paces in length, and three in width. One stone is more than seven feet high, others exceed five feet; but the greater number are smaller. West's Guide to the Lakes. Houseman's Tour. Hutchinson's History; &c. of Cumberland. Beauties of England, vol. iii.

KET, WILLIAM, in *Biography*, a tanner of Norfolk, who, in the reign of Edward VI. instigated a revolt against the government. The populace were at first excited by the complaints against inclosures, but finding their numbers increase, and already amounting to 20,000 strong, they grew insolent, and proceeded to more exorbitant pretensions. They demanded the suppression of the gentry; the placing of new counsellors about the king, and the re-establishment of the Popish religion. Ket assumed the government over them, and exercised his brief authority with the utmost arrogance. Having taken possession of Monkshead-hill, near Norwich, he

erected his tribunal under the branches of an old spreading oak, thence denominated the Oak of Reformation, and summoning the gentry to appear before him, he gave such decrees as might be expected from his character and situation. At length the earl of Warwick was sent against the rebels, and put them to flight. Two thousand fell, either in the action, or pursuit: Ket was taken and hanged at Norwich castle: nine of his followers suffered the like punishment on as many boughs of the Oak of Reformation, and the insurrection was thus entirely suppressed in 1549. Hume.

KETAH, in *Geography*, a town of Hindoostan, in Allahabad; 11 miles N. of Jionpour.

KETALEAH, a town of Hindoostan, in Bahar; 74 miles S.S.W. of Patna. N. lat. $24^{\circ} 38'$. E. long. $84^{\circ} 36'$.

KETCH, in the *Marine*, is a vessel with two masts. The masts are placed and rigged with sails, as the main and mizen-masts of a ship. Upon the bowsprit, and between that and the main-mast, they have staysails, and a very large jib. Formerly bomb-vessels and yachts were thus rigged, as ketches, but of late years as ships. At present only a few coasting vessels are rigged ketch fashion.

KETCHAR-TCHOU, in *Geography*, a town of Thibet; 10 miles S. of Giti.

KETCHENG-TASE TARTARS, a tribe of Tartars who inhabit the territory of Chinese Tartary, that lies on both the banks of the river Saghalien-Oula, and extends as far as the eastern sea. Their country, which is almost 150 leagues in length, contains only small villages, most of which are situated on the banks of the river. The language of these Tartars is different from that of the Mantchews, and is distinguished by the name of "Fiatta." It is probably the same which is spoken by the other more northerly Tartars, who live beyond the mouth of the river Saghalien.

The Tartars of Ketcheng-tase do not shave their heads, as other people of the empire. They wear their hair tied in a knot with a ribband, or enclosed in a bag behind. They appear to be less clownish than the Yupi-tase Tartars. They employ much of their time in hunting fables, and are obliged to pay a certain number of their skins in tribute.

KETCHICTEN, or KESICTEN, a country of Chinese Tartary, divided into two standards. N. lat. 43° . E. long. $117^{\circ} 38'$.

KETEMBER, a small island in the East Indian sea. S. lat. $6^{\circ} 12'$. E. long. $132^{\circ} 53'$.

KETMEBEH, a town of Natolia; 27 miles E. of Pergamo.

KETMIA, in *Botany*, the Syrian appellation of the shrub commonly called *Althea frutex*, *Hibiscus syriacus* of Linnæus. Tournefort, in his *Institutiones*, 99, t. 26, adopts it for the whole genus of *Hibiscus*; see that article. Some species of *Bombax* and *Hermannia* have also occasionally been called by this name.

KETOI, in *Geography*, one of the Kurile or Kurilskoi islands, in the N. Pacific ocean. This island is 30 versts in length, and about 10 in breadth. On it are seen high mountains, with their white rocky walls and summits: at the foot of these, and in the vallies, are forests of birch, alder, the forbes sylvestris aucuparia, and several species of pines. The island nourishes white, black-bellied, and red foxes. The sea animals are not plentiful. It is uninhabited. N. lat. $48^{\circ} 45'$. E. long. $153^{\circ} 38'$.

KETRAN, KITRAN, or *Alketrans*, a name given by some of the Arabian authors to the oil of cedar, called by the Greeks *cedria*. We have of later times formed the word *cedranum* upon this, and it has since been applied to the zopissa of the ancients, a compound made of pitch and

and wax melted together, and used for covering the bottom of ships.

KETSIO, in *Geography*, a town of Sweden, in the province of Smaland; 40 miles N.W. of Wexio.

KETSKOI, a town of Russia, in the government of Tobolsk, seated on the river Ket, which runs into the Oby at Narim; 64 miles S.E. of Narin.

KETSKEMET, a town of Hungary; 92 miles E. of Canischa.

KETTERING is a populous market-town, situated on an easy ascent, in the hundred of Huxloe, Northamptonshire, England. In the time of the Saxons, it was called Cytringan and Katcringes: the lordship was granted by king Edwy, in the year 976, to his servant Elfrige. The church, which comprises a nave, north and south aisles, and a chancel, has a handsome tower and spire at the west end. The tower consists of three stories, in each of which are large windows, or window frames, of several compartments: the angles are flanked with double buttresses: under the embattled parapet runs an ornamented fascia, and at each corner is raised a small hexagonal embattled turret; the whole surmounted by a handsome hexagonal crocketed spire, with three windows, diminishing in their size upwards, on the alternate sides. The following quaint prophetic promise is inscribed in this church: "Who so redis mine name shall have Godys blessing and our lady; and my wyfis doo sey the same." Excepting the church, Kettering has nothing to attract or interest the antiquary. Near the middle of the town is a spacious area, surrounded by some private houses and shops of respectable appearance. Here are a sessions-house, and a well endowed free-school; also an alms-house for six poor widows, and two dissenting meetings. By the return made to parliament in 1801, the number of houses appears to be 641; of inhabitants, 3011; of which number 1770 were reported as employed in various trades and manufactures, and 221 in agriculture. The chief manufactures are those of lace-working, wool-combing, and the spinning and weaving of tammies and lastings. Kettering is 16 miles distant from Northampton, and 74 from London; has a well supplied weekly market on Fridays, and four annual fairs.

Kettering was the birth-place of Dr. John Gill, a dissenting minister of distinguished eminence, through the greater part of the last century. He was one of those self-taught sons of genius, who, by overcoming what are too often considered insurmountable obstacles in literature, astonished the world by the variety and extent of their acquisitions. See GILL, JOHN.

In the vicinity of this town, to the westward, in a road called Staunth Lane, are found what are denominated *kit-cats*, a kind of pellucid stones, apparently vitrifications. These, when pulverized, are considered singularly efficacious as a styptic, and are consequently much esteemed. They are frequently discovered near the surface of the ground, but more usually in the argillaceous strata, dug for making brick. In a spot, named Stony-lands, between Kettering and Weekly woods, in quarrying for stones, were found urns, bones, coins, and other antiquities. Bridge's History of Northamptonshire. Beauties of England, vol. xi.

KETTLE FALLS, a cataract on the river Utwas, in Canada; 90 miles W. of Montreal.

KETTLE River, a river of Canada, which runs into lake Erie, N. lat. 43°. W. long. 80° 51'. See CHAUDIERE.

KETTLE, in the *Art of War*, a term the Dutch give to a battery of mortars, because it is sunk under ground.

KETTLE-Drums. See DRUM.

The kettle-drum, with trumpets, is the most martial sound of any; each regiment of horse formerly had a pair.

The kettle-drummer rides always at the head of the squadron, and his post is on the right when the squadron is drawn up.

The kettle-drum, belonging to the royal regiment of artillery, is mounted on a superb waggon, richly gilt and ornamented, and drawn by four white horses, elegantly caparisoned, with a feat for the drum-major general.

KETTLEWELL, JOHN, in *Biography*, was born at North-Allerton, in the county of York, in the year 1653. Here he received the elements of a learned education, and in 1670 was entered a servitor at St. Edmund Hall, in the university of Oxford. Having taken the degree of B.A. he was chosen a fellow of Lincoln-college, and became eminent as a tutor in that society. He took the degree of M.A. in 1677, entered holy orders, and became celebrated for his useful and instructive mode of preaching, and also for his great theological knowledge. In the year 1681, he published "Measures of Christian Obedience, &c. for the Promotion of the Piety and Peace of troubled Consciences," which procured the author a high degree of reputation as a practical and controversial writer. It was dedicated to Dr. Compton, bishop of London, but when that prelate took an active part in the measures that terminated in the abdication of James II. Mr. Kettlewell ordered the dedication to be erased from all the copies of the work which were unfolded, and directed it to be omitted in future editions. The work itself induced the countess of Bedford to appoint him one of her domestic chaplains, and it procured for him the patronage of lord Digby, who, in 1682, presented him with the living of Colehill, in Warwickshire. On this living he continued to discharge the duties of the pastoral office, much esteemed and respected, till the year 1690, when he was deprived for refusing to take the oaths of supremacy to king William and queen Mary. After his deprivation he removed to London, where he chiefly associated with gentlemen, who entertained similar sentiments with those which he himself avowed. In conjunction with Mr. Robert Nelson he concerted "a model of a fund of charity for the needy suffering, that is, the nonjuring clergy." He died of a consumption in 1695, when in the 42d year of his age. "He was," says his friend, "learned without pride, wife and judicious without cunning: he served at the altar without either covetousness or ambition: he was devout without affectation: sincerely religious without moroseness: courteous and affable without flattery, or mean compliances: just without rigour: charitable without vanity, and heartily zealous for the interest of religion without faction." His works, which are numerous, were published in 1718, in two vols. folio. Biog. Brit.

KETU, in *Hindoo Mythology*, is the regent of the descending node, or the dragon's tail. The following legend on this subject is from Moor's Hindoo Pantheon, p. 282. "Rahu was the son of Karyapa and Diti (see KARYAPA), according to some authorities; but others represent Sialhika (perhaps the Sphinx) as his natural mother. He had four arms; his lower parts ended in a tail, like that of a dragon, and his aspect was grim and gloomy, like the darkness of the chaos, whence he had also the name of Tamasa. He was the adviser of all mischief among the Daityas, or evil spirits, and his chief delight was to sow dissension among the Devas, or beneficent deities. When the gods had produced the Amrita, or elixir of immortality, by churning the ocean (see KURMAVATARA), he disguised himself like one of them, and received a portion of it; but the Sun and Moon discovering the fraud, Vishnu severed his head and two of his

his arms from the rest of his monstrous body. That part of the nectareous fluid, that he had time to swallow, secured his immortality; his trunk and dragon-like tail fell on the mountains of Malaya, where Mini, or Brahman, carefully preserved them by the name of Ketu; and, as if a complete body had been formed from them, like a dismembered polype, he is said to have adopted Ketu as his own child. The head, with two arms, fell on the sands of Barbara, where Pitheas was then walking with his wife Sinhika: they carried the Daitya to their palace, and adopted him as their son. This extravagant tale is no doubt astronomical; Rahu and Ketu being the *nodes*, or what astrologers call the head and tail of the dragon. It is added, that they appeased Vishnu, and obtained re-admission to the firmament, but were no longer visible from the earth, their enlightened sides being turned from it; that Rahu strives, during eclipses, to wreak vengeance on the Sun and Moon who detected him; and that Ketu often appears as a comet, a whirlwind, a fiery meteor, or water-spout, or a column of sand. Fifty-six comets are said, in a book called Chintamani, to have sprung from Ketu; and Rahu had a numerous progeny of Grahases, or crocodiles." A plate of the Hindoo zodiac includes Rahu and Ketu, the latter appearing merely as a head of a black colour, handsomely ornamented, and resting against a pillow. In a plate of the Indian zodiac, published by sir W. Jones in the second volume of the Asiatic Researches, Ketu is mounted on a frog; the meaning of which, if it have any, has not been explained. See RAHU.

KETVER, in *Geography*, a town of Grand Bucharia, on a mountain, taken by Timur Bec in 1398; 100 miles S. of Badakshan.

KETZIN, a town of Brandenburg, in the Middle Mark; 8 miles N.W. of Potsdam.

KETZLDORF, a town of Bohemia, in the circle of Chrudim; 12 miles S.E. of Leutinschl.

KEVALCOTTY, a town of Thibet; 18 miles N.W. of Sirinagar.

KEVEL of Buffon, in *Zoology*. *Antelope Kevella* of Linneus, *Ahy* of Kämpfer, and *flat-horned antelope* of Pennant, has large horns, which are flattened, and bent in form of a lyre; the fur is yellowish, with pale streaks, and a dark coloured band runs along each side. This animal inhabits Barbary, Senegal, and Persia. It is about the size of a small roe; lives in large flocks, and, like most species of the genus, is reckoned very delicate food, though it has a musky odour when alive. In both sexes the horns are surrounded with prominent rings, usually from 14 to 18, except the ends, which are smooth: they are bent in the same manner with those of the antelope doreas, and in general the two animals resemble each other very much, except that the horns of this species are flattened, and have a greater number of rings.

KEVELS, or CHEVILS, in a *Ship*, are two pieces of timber nailed to the inside of a ship, from whence the upper ends branch outward into arms or horns, serving to belay the great ropes, by which the bottoms of the mainmast and foremast are extended.

KEUKZER, in *Geography*, a town of Persia, in Farsistan; 40 miles S. of Jezdkait.

KEULA, a town of Germany, in the county of Schwartzburg; 11 miles N. of Mulhausen.

KEURA, in *Botany*, Forsk. *Ægypt*. Arab. 172. Thunb. Nov. Gen. 35. See KAIDA and PANDANUS.

KEURBOOM RIVER, in *Geography*, a river on the S. coast of the colony of the Cape of Good Hope, which, like the Knyfna, runs up into the midst of tall forests, and might be navigated by boats to a considerable distance;

but its mouth, in Plettenberg's bay, is completely fanded up by the almost perpetual rolling swell of the sea, from the south-eastward upon the sandy beach.

KEURN, a town of Sweden, in the government of Wafa; 96 miles S.E. of Wafa.

KEVROI, a town of Russia, in the government of Archangel; 100 miles S.E. of Archangel.

KEUSCHBERG, or KIADE, a town of Saxony, remarkable for a victory obtained by Henry the Fowler over the Huns, in 933; 6 miles S.E. of Merseburg.

KEW, a village and parish in the hundred of Kingston, and county of Surry, England, is pleasantly seated on the southern banks of the river Thames, at the distance of 6½ miles westward of London. In the year 1800 it contained 85 houses, and 424 inhabitants. Previous to the year 1769, this place was only a hamlet to Kingston, but in that year an act of parliament was obtained to unite this and Petersham in one vicarage. The neighbouring inhabitants then subscribed to build a chapel on a piece of land given by queen Anne. In this is a tablet to the memory of Jeremiah Meyer, a celebrated miniature painter; and in the adjoining cemetery repose the remains of Thomas Gainsborough, an artist of distinguished merit. (See GAINSBOROUGH.) Over the Thames, at this place, is a handsome stone bridge of seven arches, built from a design by Paine. It was opened in 1789, and is private property; to defray the expences of which a toll is exacted from all persons, carriages, horses, &c. passing over it. In this village is one of the royal palaces, which is held on lease. It is a small house, in a bad style of architecture, and in a flat, confined situation; yet, from its contiguity to the fine and interesting gardens of Kew, has continued a royal residence for many years. His present majesty, George III. has commenced a new palace upon a larger scale; but the works have been long suspended, and it is not improbable that both these structures may be utterly deserted by the next monarch. It is built from designs of James Wyatt, esq. The gardens of Kew are the pride and ornament of the place. They are comprised in 120 acres of land, and are planted with almost every species of exotic tree, shrub, and plant that can be preserved alive in this country. Sir William Chambers published a particular account of these gardens, and of the various ornamental buildings within them; but since sir William's decease many additions and improvements have been made to the exotic garden. The late Mr. Aiton, gardener, gave some account of the rare plants, &c. cultivated here, in a work, entitled "Hortus Kewensis." The following are the names and dates of the different buildings erected by sir William Chambers within these gardens: The Orangery, or Greenhouse, built in 1761, is 145 feet long, 30 feet wide, and 25 feet high. In the same year, and near the same building, was erected "The Temple of the Sun," partly resembling one of the temples of Balbec. In the Flower Garden is an "Aviary," and near it a "Menagerie," with a pavilion designed in imitation of a Chinese opening. Contiguous to this stands "The Temple of Bellona," built in 1760, of the prostyle kind, with portico tetrastyle Doric. In a solitary walk, near the lake, is "The Temple of the God Pan," of the monopertous kind, of the Doric order, built in 1758. On an eminence stands "The Temple of Eolus," of similar figure with the preceding. Not far from this, at the head of the lake, is a Chinese octagon, of two stories, called "The House of Confucius," built from designs by Goupy. Passing hence through a winding shady walk, the stranger is next conducted to a Corinthian colonnade, called "The Theatre of Augusta," built in 1760. "The Temple

Temple of Victory" is the next object, executed in 1759, in commemoration of a victory obtained by prince Ferdinand of Brunswick, in that year. The Alhambra is imitative of a moresque building; and the great Pagoda is built in imitation of the Chinese TAA. The base is a regular octagon of 49 feet in diameter, and the elevation is composed of 10 prisms, or 10 stories, and is 163 feet in height. The other buildings are called the Mosque, the Gallery of Antiques, the Temple of Arethusa, and the Ruin. The Gardens at Kew are opened every Monday during the summer. Lysons's Environs of London.

KEWAN, a town of Hindoostan, in the circar of Kitchwara; 10 miles W. of Sheergur.

KEWEH, a town of Natolia, on the Sakaria; 24 miles E. of Isnik.

KEXHOLM, a town of Russia, in the government of Viborg, built on two islands at the mouth of a river, on the side of lake Ladoga. The houses are constructed of wood, but the town is well fortified, and defended by a citadel; 40 miles E.N.E. of Viborg. N. lat. 61° . E. long. $29^{\circ} 50'$.

KEXLEBODA, a town of Sweden, in the province of Smaland; 36 miles S.S.W. of Wexio.

KEY, GREAT, a small island in the East Indian sea, about 50 miles long, and from 5 to 12 broad. S. lat. $5^{\circ} 24'$. E. long. $133^{\circ} 28'$.

KEY, *Little*, an island in the East Indian sea, about 60 miles in circumference. S. lat. $5^{\circ} 52'$. E. long. $133^{\circ} 12'$.

KEY, a little iron instrument for the opening of locks.

L. Molinus has a treatise of keys, "*De Clavibus Vetricum*," printed at Upsal. He derives the Latin name *clavis* from the Greek *κλειω*, *claudio*, *I shut*; or from the adverb *clam*, *privately*; and adds that the use of keys is yet unknown in some parts of Sweden.

The invention of keys is owing to one Theodore of Samos, according to Pliny and Polydore Virgil; but this must be a mistake, the use of keys having been known before the siege of Troy: mention even seems to be made of them in the nineteenth chapter of Genesis.

Molinus is of opinion, that keys, at first, only served for the untying certain knots, wherewith they anciently secured their doors; but the Laconic keys, he maintains, were nearly akin in use to our own: they consisted of three single teeth, and made the figure of an E; of which form there are still some to be seen in the cabinets of the curious.

There was also another key, called *βαλαναγρη*, made in the manner of a male screw, which had its corresponding female in a bolt affixed to the door.

KEY is hence become a general name for several things serving to shut up or close others.

KEY, or *Key-stone*, of an *Arch*, or *Vault*, is the last stone placed atop thereof; which, being wider and fuller at the top than the bottom, wedges as it were, and binds in all the rest.

The key is different in the different orders; in the Tuscan and Doric, it is a plain stone, only projecting; in the Ionic, it is cut, and waved somewhat after the manner of consoles; in the Corinthian and Composite, it is a console enriched with sculpture, foliage, &c.

M. Belidor makes the thickness of the arch-stones of a bridge, one twenty-fourth part of the width of the arch; but Mr. Gautier, another experienced engineer, makes their length, in an arch twenty-four feet wide, two feet; in arches, forty-five, sixty, seventy five, ninety wide, three, four, five, six feet, respectively: and it is observed by Mr. Muller, that the thickness allowed by Belidor is not suffi-

cient to prevent the weight of the arches from crushing the key stones to pieces by their pressure against one another. Muller's Pract. Fortif. p. 253.

The name key-stones, or arch-stones, is sometimes also given to all the stones which form the sweep of an arch, or vault, answering to what the French more distinctly call *voussoirs*.

KEY is also used for the ecclesiastical jurisdiction; particularly for the power of excommunicating, and absolving. The Romanists say, the pope has the power of the keys, and can open and shut paradise as he pleases; grounding their opinion on that expression of Jesus Christ, "I will give thee the keys of the kingdom of heaven."

In St. Gregory we read, that it was the custom heretofore, for the popes to send a golden key to princes, wherein they always enclosed a little of the filings of St. Peter's chains, kept with great devotion at Rome; and that these keys were worn in the bosom, as being supposed to contain some wonderful virtues.

KEY, in *Music*, is a certain fundamental sound, or tone, to which the whole piece, be it concerto, sonata, cantata, &c. is accommodated; and with which it usually begins, but always ends.

To get an idea of the use of the key, it may be observed, that as in an oration there is a subject, *viz.* some principal person or thing, to which the discourse is referred, and which is always to be kept in view, that nothing unnatural and foreign to the subject may be brought in; so in every regular piece of music, there is one note, *viz.* the key, which regulates all the rest. The piece begins and ends in this; and this is, as it were, the musical subject, to which a regard must be had in all the other sounds of the piece. Again, as in an oration there are several distinct articles, which refer to different subjects, yet so as they have all a visible connection with the principal subject, which regulates and influences the whole; so in music there may be various subaltern subjects, that is, various keys, to which the different parts of the piece may belong: but then, they must be all under the influence of the first and principal key, and have a sensible connection with it.

To give a more distinct notion of the key, we must observe, that the octave contains in it the whole principles of music, both with respect to consonance or harmony, and succession or melody; and if either scale be continued to a double octave, there will, in that case, be seven different orders of the degrees of an octave, proceeding from the seven different letters, with which the terms of the scale are marked. Any given sound, therefore, *i. e.* a found of any determinate pitch or tune, may be made the key of the piece, by applying it to the seven natural sounds arising from the division of an octave, and repeating the octave above or below, at pleasure. The given sound is applied as the principal note or key of the piece, by making frequent closes or cadences upon it; and, in the progress of the melody, no other but those seven natural sounds can be admitted, while the piece continues in that key, every other sound being foreign to the fundamental, or key.

For instance, suppose a song begun in any sound, and carried on upwards, or downwards, by degrees and harmonical distances, so as never to touch any sounds, but what are referable to that first sound as a fundamental, *i. e.* are the true sounds of the natural scale proceeding from the fundamental; and let the melody be so conducted through those natural sounds, as to close and terminate in the fundamental, or any of its octaves above or below; that sound is called the key of the melody, because it governs all the rest, limiting them so far, as that they must be to it, in the relation

tion to the seven essential sounds of an octave; and when any other sound is brought in, it is called *going out of the key*.

From which way of speaking, *viz.* a song's continuing in, or going out of the key, it may be observed, that the whole octave, with its natural sounds, come under the idea of a key; though the fundamental or principal sound is, in a peculiar sense, called the key.

In which last sense of the word key, (*viz.* where it is applied to one fundamental sound,) another sound is said to be out of the key, when it has not the relation to that fundamental of any of the natural sounds belonging to the continuous division of the octave.

Here too it must be added, with respect to the two different divisions of the octave, that a sound may belong to the same key, *i. e.* it may have a just musical relation to the same fundamental in one kind of division, and be out of the key with respect to another.

Now a piece of music may be carried through several keys; *i. e.* it may be given in one key, and be led out of that into another, by introducing some sound foreign to the first, and so on to another: but a regular piece must not only return to the first key, but those other keys too, must have a particular connection with the first. It may be added, that those other keys must be some of the natural sounds of the principal key, though not any of them at pleasure.

As to the distinctions of keys, we have already observed, that to constitute any given note or sound, a key, or fundamental sound, it must have the seven essential or natural notes added to it; out of which, or their octaves, all the notes of the piece must be taken, while it keeps within the key, *i. e.* within the government of that fundamental. It is evident, therefore, there are but two different species of keys, which arise according as we join the greater or less third, these being always accompanied with the sixth or seventh of the same species; the third *g*, for instance, with the sixth or seventh *g*, and the third *f* with the sixth and seventh *f*.

This distinction is expressed under the names of *sharp* key, which is that with the third *g*, &c. and the *flat* key, which is that with the third *f*, &c.: whence it is plain, that how many different closes soever there be in a piece, there can be but two keys, if we consider the essential difference of keys; every key being either flat or sharp, and every sharp key being the same, as to melody, as well as every flat one.

It must be observed, however, that in common practice the keys are said to be different, when nothing is considered but the different tone, or pitch of the sound, in which the different closes are made. In this sense, the same piece is said to be in different keys, according as it is begun in different sounds, or degrees of tune.

To prevent any confusion which might arise from using the same word in different senses, Mr. Malcolm proposes the word *mode* to be substituted instead of the word key, in the former sense; that is, where it expresses the melodious constitution of the octave, as it consists of seven essential and natural sounds, besides the fundamental; and in regard there are two species of it, he proposes, that that with a third *g* be called the *greater mode*; and that with a third *f*, the *lesser mode*: appropriating the word key to those sounds of the piece in which the cadence is made; all of which may be called *different* keys, in respect of their different degrees of tune.

To distinguish then accurately between a *mode* and a key, he gives us this definition; *viz.* an octave, with all its natural and essential degrees, is a mode, with respect to the constitution, or manner of dividing it; but with respect to

its place in the scale of music, *i. e.* the degree or pitch of tune, it is a key; though that name is peculiarly applied to the fundamental.

Whence it follows that the same mode may be with different keys; *i. e.* an octave of sounds may be raised in the same order, and kind of degrees, which makes the same mode, and yet be begun higher or lower; *i. e.* be taken at different degrees of tune, with respect to the whole, which makes different keys; and *vice versa*, that the same key may be with different modes, *i. e.* the extremes of two octaves may be in the same degree of tune, yet the division of them be different.

KEYS also imply those little levers in the fore-part of an organ, harpsichord, or piano-forte, by means of which wind is given to the pipes, and the jacks or hammers strike the strings of the instrument.

In large organs there are generally three sets of keys; one for the great or full organ, one for the choir organ, and one for the swell and echoes. The long keys used to be black, and the short, or flats and sharps, white; but a contrary practice took place about the beginning of the last century.

KEYS, in *Sea Language*, a name given to certain rocks lying near the surface of the water, particularly in the West Indies.

KEY, a dry piece of tapering oak, driven into searfs to set them close.

KEY, in a *Naval Sense*. See KEY.

KEY, in *Polygraphy*, and *Steganography*, denotes the alphabet of a cipher; which is a secret known only to the person who writes the letter, and him who decipheres it. See ALPHABET and CIPHER.

Some ciphers have a single key, where the same characters are used throughout; in other ciphers, the characters are varied, and the key is doubled.

KEYS, a denomination given to the seeds of the ash.

KEY-Lough, in *Geography*, a lake of Ireland, in the northern part of the county of Roscommon, near the town of Boyle. The river Boyle flows through this lake, which is a beautiful piece of water, interspersed with several islands, some of them well wooded, and others highly cultivated. It is sometimes called Kington lough.

KEYNSHAM, a market town and parish in the hundred of Keynsham, and county of Somerset, England, is five miles east of Bristol, and seven west of Bath, on the great public road between those cities. In the year 1800, the town consisted of 286 houses, and contained 1591 inhabitants. Here was formerly a considerable woollen manufactory, but at present the staple trade of the town is malting. An abbey was founded here, in 1170, by William earl of Gloucester; and at the dissolution was granted to Thomas Bridges, some of whose descendants still have an interest in the lands annexed to it. The sub-stratum of the county is an immense rock; in which are imbedded vast numbers of the cornu-ammonis, or snake stones. Many of these are very large, and by the common people are believed to have originated from some miraculous power. The church is a large building. Here are a weekly market, and two annual fairs. Collinson's History, &c. of Somersetshire. 3 vols. 4to.

KEYSLER, JOHN GEORGE, in *Biography*, a celebrated traveller, was born at Thurnau, in the county of Giech, in the year 1683. He received a good education, and manifested, at an early period, a strong attachment to the sciences. At a proper time, and having laid in a good stock of elementary knowledge, he was entered at the university of Halle, where he studied jurisprudence, without neglecting the

the other branches of academical instruction. When he had finished his studies, he was invited to superintend the education of Charles Maximilian, and Christian Charles, counts of Giech-Buchan, with whom he repaired to Halle in 1717, and then accompanied them on their travels in foreign countries. In his journey he met with the celebrated Roland, who recommended to his attention the immense field of German antiquities, as yet almost untouched: he accordingly caught at the idea, and formed the resolution of undertaking something systematic on the antiquities of Germany, and the origin of its inhabitants. He went through the principal towns in Germany and the Low Countries, collecting, as they occurred, materials for his intended work. In consequence of the great reputation which he acquired in his first tour, M. Bernstorff, minister of his Britannic majesty in Hanover, an enlightened statesman, engaged him as a travelling tutor to his sons. After remaining two years in Hanover, he obtained permission, in 1718, to visit England for his own improvement. At London and Oxford he met with a kind reception, but nothing, probably, pleased him more, than the honour of being elected a member of the Royal Society. He wrote some tracts at this period, one containing several curious observations on Stonehenge, and a dissertation on the consecrated mistletoe of the Druids; and on his return to Hanover in 1720, he published his immortal work, entitled "*Antiquitates selectæ Septentrionales et Celticæ*," in which the author is exceedingly happy in solving a great number of difficulties never before sufficiently explained. In 1727, Keyser's pupils, who continued under his care more than ten years, accompanied him to Tübingen, and, in 1729, they began their travels, which comprised the whole of Germany, Switzerland, Italy, Hungary, France, England, and Holland. On their return ample provision was made for the tutor, and they entrusted him, at the same time, with a valuable library, their collection of medals and natural curiosities, and even gave him the chief management of their domestic concerns. M. Keyser, in the course of his travels, had made a valuable collection of books, antiques, &c., to which he added, by purchase, that of M. Eckard, and to prevent the whole from being dispersed, he destined it after his death to be added to that of M. Bernstorff. He was of an open and communicative disposition, and ready to assist in their literary labours, all those who stood in need of his advice. He rendered M. Eckard great service when about to publish his *German Antiquities*, after the model of the "*Theaurus Antiquitatum Græcarum et Romanarum*," by Grævius and Gronovius. This work was never printed. In 1728, when M. Jark reprinted the work of Schedius, on the German deities, Keyser not only corrected it, but furnished him with considerable additions, and subjoined an ingenious dissertation "*De cultu Solis*." He died suddenly, in June 1743, at Stentenbourg, an estate belonging to M. Bernstorff. His travels were translated into the English language from the second edition in German, and published in four vols. 4^{to}. Gen. Biog.

KEYSERSTUL, in *Geography*, a town of Switzerland, in the county of Baden, on the river Rhine, with a wooden bridge to Schaffhausen; 9 miles N.N.E. of Baden. N. lat. 47° 37'. E. long. 8° 15'.

KEY-SIMA, an island of Japan, between Corea and the W. coast of Nippon.

KEY-WALE'LA, an island in the East Indian sea, about 45 miles in circumference. S. lat. 5° 36'. E. long. 138°.

KEYWAWA, a small island near Charleston harbour, South Carolina.

KEYZER'S BAY, a bay on the S. coast of the island of Sumatra. N. lat. 5° 40'. E. long. 104° 38'.

KEZEMSKA, a town of Russia, in the government of Irkutsk, on the Angara; 40 miles S.W. of Ilimsk.

KEZEREH, a town of Natolia; 40 miles E. of Caramena.

KEZIL, a river of Persia, which runs into the Caspian sea, near Reshd.

KEZIL, *Khesil*, or *Khezil*, a river of Asia, which rises in the mountains of Bucharia, N.E. of Samarcand, and formerly ran into the Caspian sea; but the Russians, in 1719, endeavouring to trace the stream, were put to death by the Tartars, who turned the current of the river into lake Aral, by uniting it with the Gihon: but this change of the course of the Gihon has been disputed. See *Oxus*. See also *KHARASM*.

KEZIL-Agha, a town of Persia, in the province of Gililan; 20 miles N. of Lenkeran.

KEZIL-Kaja, a town of Natolia; 25 miles S. of Izbarteh.

KEZIN, a town of Poland, in Volhynia; 10 miles W. of Krzemieniec.

KEZMA, a town of Russia, in the government of Irkutsk, on the Tunguska; 160 miles N.N.W. of Ilimsk.

KEZUC, a town of Persian Armenia; 4 miles S. of Erivan.

KHABUR, a river of Asiatic Turkey, which rises 20 miles E. of Harran, and runs into the Euphrates at Kerkisia.—Also, a river of Kurdistan, which passes by Bethis and runs into the Tigris; 15 miles S.E. of Gezira.

KHADARAH, *EL*, or *CHADRA*, a town of Algiers, in the province of Tremecen, seated on an eminence near the river Shelliff. Dr. Shaw concludes from its ruins, which are about three miles in circumference, that it was once a large place. According to Ptolemy, its ancient name was "*Zucchabbari*," and according to Pliny "*Succabar*" and "*Colonia Augusta*." Eastward are the remains of a stone bridge, probably the only one ever built over the Shelliff, though travellers are much inconvenienced, in the winter season, by waiting a whole month before they can ford it; 55 miles S.S.W. of Algiers.

KHALEKAN, *EBN*, in *Biography*, a celebrated biographer of illustrious Mussulmen, particularly of such as were distinguished by their proficiency in the sciences, was born in the year 608, and died in 681 of the Hegira. His work is entitled "*Vasat Alaian*," or "*The Deaths of illustrious Men*," and was undertaken by him at the city of Cairo, in Egypt, under the reign of Bibars, a sultan of the Mameluke dynasty. Being appointed by that prince cadi of Damascus in the year 659, the duties of his new employment so far interrupted his studies, that he was not able to finish his work before the year 672.

KHAMI, in *Geography*. See *HAMI*.

KHAMIES BERG, a cluster of mountains belonging to the colony of the Cape of Good Hope, situated in the middle of the country, that was formerly inhabited by the Namaqua Hottentots, at the distance of five days' journey N.W. from the *Hantam*, (which see,) over a dry sandy desert almost destitute of water. This cluster of mountains being the best, and indeed almost the only habitable part in the Namaqua country, has been taken possession of by the wandering peasantry, who, to the advantage of a good grazing country, had the additional inducement of settling there, from the easy means of increasing their flock of sheep from the herds of the native Hottentots, who, however, are now so reduced and scattered among the Dutch farms, as scarcely to be considered a distinct tribe of people. The

copper mountains commence where the Khamies-berg ends, the whole surface of which is said to be covered with malachite, or the carbonate of copper, and cupreous pyrites. But the ores of these mountains, though abundant and rich, are of no great value on account of the total want of every kind of fuel to smelt them, as well as of their very great distance from the Cape, and from there being neither bay nor river, where they could be put on board of coasting vessels. In the Khamies-berg is also found, in large blocks, that beautiful species of stone, to which mineralogists have given the name of Prehnite.

KHAMIR. See **CHAMIR**.

KHAN, or **KAN**, the name of an officer in Persia, answering to that of *governor* in Europe. There are khans of provinces, countries, and cities, who have different additions to distinguish them. In the language of the north of Asia, this title expresses the full extent of the regal dignity.

KHANAKA, a town of Kharasm, on the Gihon; 250 miles S.W. of Samarcand.

KHANGA, EL, a town of Egypt, formerly enriched by the caravans which passed from Cairo to Syria, and containing about 1000 inhabitants; 12 miles N.E. of Cairo.

KHANUDUM, a large lake of Persia, in the province of Adirbeitzan, 60 miles long and 30 broad; called also the lake of Urmia; 30 miles S.W. of Tabris.

KHARA, a malignant being, according to Indian legends, who commanded a legion of 14,000 demons, like himself, in the wars of Lanka, as Homerically described in the *Rama-yana*. He espoused the cause of Ravana, and was with his followers destroyed by Rana.

KHARASM, **CHARASM**, or *Kharizm*, in *Geography*, a country of Asia, bordered on the N. by Turkestan, on the E. by Great Bucharia, on the S. by Chorasan, or Korasan, and on the W. by the Caspian sea; extending from the Gihon, or Amu to this sea, and terminating N. and S. in wide deserts. Its chief town is Khiva. This country is about 350 miles in length and breadth, and in the time of Zingis, was a powerful kingdom, including at that time Korasan, and a part of Great Bucharia. D'Anville supposes, that this country was the Chorasmia of antiquity, and he supposes Korasan to have been the seat of the Parthians. In the 10th century, Ebn Haukal calls this country Khuarezmi, and says that the river Gihon flows into the lake of Khuarezmi, while he terms the Caspian the sea of Khozr. We have reason to believe, that the deserts, probably occasioned by the decomposition of hills of sand-stone, have increased in Kharasin; and these encroachments may be estimated from the historians of Zingis and Timur. At present this state is almost restricted to the district of *Khiva* (which see), the circuit of which may be performed on horseback in three days; but there are five walled cities or rather towns within half a day's journey of each other. The inhabitants are Turcomans and Uzbeks, besides the Sarts, which perhaps is another name for the Tadjiks. The khan is absolute and altogether independent of any other power, except the Mulla Bashi, or high priest, by whom he is controlled. The Kievinki Tartars differ very little from the Kirgeese or *Kirghises* (which see), but surpass them in cunning and treachery. Their manners are the same, only that the Kirgeese live in tents, whilst the others inhabit cities and villages. Their only trade is with Bokhara and Persia, whither they carry cattle, furs, and hides, all which they have from the Kirgeese and Turcoman Tartars, who are often very troublesome neighbours to them. The place itself produces little more than cotton, lamb-furs of a very

mean quality, and a small quantity of raw silk, some of which they manufacture. Hanway, cited by Pinkerton. (See *Khiva*.) The history of Kharasin has been well illustrated by its king, or khan, Abulghazi, in his general history of the Tartars, written about the year 1660. See his biographical article.

KHAREJITES, the first heretical sect among the Mahometans, which revolted from Ali in the 37th year of the Hegira; and hence their name, which signifies "revolters," or "rebels." This sect commenced with 12,000 men, who abandoned Ali and his cause, after having fought under him at the battle of Seffin, taking offence at his submitting the decision of his right to the caliphate, which Moawiyah disputed with him, to arbitration, though they themselves had first obliged him to do it. They were also called Mohakkemites, or Judiciarians; because the reason which they gave for their revolt was, that Ali had referred a matter concerning the religion of God to the judgment of men, whereas the judgment, in such case, belonged only to God. The heresy of the Kharejites consisted in two particulars; viz. 1. That they affirmed a man might be promoted to the dignity of Imam, or prince, though he was not of the tribe of Koreish, nor even a freeman, provided he was a just and pious person, and endowed with the other requisite qualifications, and also held, that the Imam, if he turned aside from the truth, might be deposed or put to death, and that there was no absolute necessity for any Imam at all in the world. 2. That they charged Ali with sin, for having left an affair to the judgment of men, which ought to have been determined by God alone; and went so far as to declare him guilty of infidelity, and to curse him, on that account. In the following year, viz. the 38th of the Hegira, all the Kharejites, who persisted in their rebellion, to the number of 4000, were cut to pieces by Ali. Nine of them are said to have escaped, two into Oman, two into Kerman, two into Segestan, two into Mesopotamia, and one to Tel Mawrûn; and to have propagated their heresy in those places, the same remaining there to this day. The principal sects of the Kharejites, besides the Mohakkemites already mentioned, are six; which, differing in other respects, agree in absolutely rejecting Othman and Ali, preferring the doing of this to the greatest obedience, and allowing marriages to be imparted on no other terms; that they account those who are guilty of grievous sins to be infidels; and that they hold it necessary to resist the Imam when he transgresses the law. See *Koran*, *Introd.*

KHATANGA, in *Geography*, a river of Russia, that has its source in a lake in the government of Tobolsk, about 68 N. lat. and 110 long; and in 120 long. rushes into a large bay of the Frozen ocean, called Khatanskaia Guba. This river pursues the greater part of its course through a low and very marshy country; and the most considerable rivers which add to its waters are the Kheta and the Potigan.

KHATOUN-SERAI, a town of Asiatic Turkey, in Caramania; 12 miles S. of Cogni.

KHAUAR, or **CHEVER**, a town of Persia, in the province of Irak, seated on a mountain, which terminates the province of Irak towards Mazanderan, and gives name to a pass, called the Strait of Khauar; 200 miles N. of Isfahan.

KHAUASH, a town of Persia, in Segestan; 18 miles N. of Zareng.

KHAULAN, a small district of Arabia, in the province of Yemen; a few leagues S.E. of Sana. It is governed by an independent scheick, the representative of a very ancient family; who ordinarily resides at Beit Rodsje, a small town in his own dominions. Several places which once belonged

longed to the prince of Khawlan have been gradually annexed to the dominions of the Imam.—Also, a small district of Arabia, lying among the mountains westward from Saade, upon the road from Sana to Mecca, four days journey from Hali, the extreme city upon that side of the sheriff's territory. It has an independent scheick.

KHAZARES, the name of a bold and powerful Turkish tribe, which first occupied the isthmus of Caucasus between the Caspian and the sea of Azof. In the seventh century they began to be famous, and till towards the middle of the ninth century their state was increasing and flourishing. About that time the empire of the Khazares extended from the Volga and the Caspian, across the Caucasian isthmus, the peninsula of the Crimea, and what is now the south of Russia, as far as to Moldavia and Walachia; and several Slavonian tribes, particularly the Polianes about Kief and on the Dnieper, the Severans, on the rivers Desna, Sem, and Sula, the Viatitsches on the Oka, and the Radimitsches on the Sosna, were tributary to them. But after the year 862, three nations effected their downfall; viz. the Russians, the Petschenegs, and the Uzes. The Varagian or Russian leaders, Oskold and Dir, ravished from them the dominion over the Polianes; Oleg, in 884, reduced the Severans and the Radimitsches to his authority. His successor, in 964, conquered the territory of the Viatitsches and the nine Khazar countries on the isthmus of Caucasus. The Khazares lost the residue of their dominion about 1016, to the combined forces of the Russians and Romans of the east. The nation, indeed, continued for some time longer, but they were submissive and tributary to the Russians. Tooke's Russ. Emp. vol. i.

KHAZINE, the grand seignior's treasury. See **TREASURY**, and **EXCHEQUER**.

Here are kept registers of receipts, accounts of provinces, in drawers, marked with the years, and the places' names: here is also kept part of the emperor's wardrobe.

Every day of the divan this treasury is opened, either to take out, or put something in; and the principal officers, who have the charge of it, are all to assist at this opening. The tchaouch-bachi, in their presence, first breaks the wax with which the key-hole had been sealed up, and carrying it to the grand vizir, that minister first kisses it, and then draws out of his bosom the grand seignior's gold seal. In the mean time he looks narrowly after the officer, who, when he has done his business in the treasury, locks and seals up the place, and returns the seal to the vizir with the same ceremony as before.

Besides this, there are other apartments for the money, where the officers are never allowed to enter with any clothes that have pockets in them.

KHEIR, in *Geography*, a town of Hindoostan, in the country of Vissapour; 18 miles N. of Poonah.

KHEIVAN, a town of Arabia, in a district of the same name, in the extensive country of Hachid-n-Bekil, is remarkable for having been the seat, first of the Hanjare monarchs, and afterwards of the Imams. Ruins of a very ancient palace are still to be seen there.

KHEMLASA, a large walled town of Hindoostan, adjoining to which is a fort, built upon a hill. It belongs to the district of Sagur, which is distant about 17 fofs to the south eastward.

KHIEBAR, or **KEIBAR**. See **HEDJAS**.

KHIEVA, or **KHIVA**, a district of KHARASM, which see.—Also, the capital of this district and of Kharasm, situated on a rising ground, W. of the river Gihon, and having three gates, and a very thick, strong wall of earth, much

higher than the houses, with turrets at small distances, and a broad deep ditch full of water. It occupies a considerable space, and commands a pleasant prospect of the adjacent plains, which the industry of the natives has rendered very fertile; but the houses are low, mostly built with mud, the roofs flat, and covered with earth. The city of Urgheenz, which was formerly the capital of Kharasm, is now in ruins, with only a mosque remaining. The most southern town in the dominions of Khiva is Azarist, or Hazarasp, which adjoins to the great desert, called *Karakum*, which see. Khiva is said to stand at the distance of 17 days from the Caspian sea, and from Orenburg 33, computing the day's journey at 40 versts; equal, by Hanway's account, to 17 British miles; so that the distance of Khiva from the Caspian would be 459 British miles, while our maps scarcely allow 300. In 1739, the khan of Khiva assembled an army of 20,000 men, to oppose Nadir; but the city surrendered at discretion. According to the information of Pallas, the people of Khiva bring to Orenburg considerable quantities of raw cotton. But the coasts of the Caspian are held by some remains of Turcomans in the north, and by Uzbeks in the south. A more considerable trade is maintained with *Mangyshlak*, which see. As the merchants of Khiva brought gold and gems to Astrachan, probably from the two Bucharas, an idea was suggested to Peter the Great, that these precious products were found in Kharasm, in consequence of which he attempted a settlement. But the Russians, to the number of 3000, advancing under the command of a Circassian prince, called Beckawitz, towards Khiva, were all cut off by the Uzbeks. Upon this occasion, as it has been said, these Tartars changed the course of the Khesel or Kezil, which formerly fell into the Caspian; but as this river is on the E. of the Gihon, it is clear that it could not pass that river to join the Caspian; and in the 10th century the Gihon is known to have flowed into the Aral. It is not improbable that, before the deserts encroached on Kharasm, one or two rivers might have run to the Caspian from the east; or perhaps these fables may have arisen from one or two small branches of the Amu having joined that sea. Pinkerton. Khiva is 265 miles N.W. of Samarcand. N. lat. 41° 30'. E. long. 58° 25'.

KHILLI, a cape on the N.E. coast of the island of Negropont. N. lat. 38° 36'. E. long. 24° 4'.

KHILLIS, a town of Syria, governed by an Aga; which, some years ago, was created into a pachalic, to restrain the Arabs; but the pacha being defeated, it was again put under an Aga. It is situated at the foot of Mount Taurus, and is a celebrated market for cotton; 23 miles N.N.W. of Aleppo.

KHIRTIPPOOR, a town of Nepal, the reduction of which cost the conqueror so much trouble, that in resentment of the resistance made by the inhabitants, he cut off all the men's noses. Col. Kirkpatrick, at the distance of 23 years, was reminded of this act of barbarity, by observing that a great proportion of the people appointed to transport his baggage across the hills were deprived of their noses. To perpetuate this exploit, the sovereign ordered the name of the place to be changed to Nashtapoor, which signifies "the town of men without noses."

KHONDEMIR, in *Biography*, a celebrated Persian historian, who obtained the patronage of the emir Ali Shir, a lover and protector of men of letters, whom he inspired with a passion for his own favourite pursuit, and with the desire of forming a collection of the principal writers in this class of science. The great object which Khondemir had in view, was to facilitate the study of history by drawing it up in a

more methodical manner, than had been done by other writers, and the result of his labours was a judicious compendium of oriental history from the creation of the world to the year 875 of the Hegira, under the title of "Khelassiat Alakhar fi Veian Ahual Alakhia," that is, "A faithful and correct Summary of what is valuable and interesting in the most authentic and genuine Histories."

KHORASAN, **KORASAN**, *Chorasán*, or *Corasán*, in *Geography*, a province of Persia, situated in the N.E., and bounded on the N. by Kharasán, on the E. by Bucharia and Candahar, on the N.E. by the river Gihon or Oxus, on the S. by the lake of Zurrá, or Durrah, and Segeftán, and on the W. by the province of Mazanderán and the Caspian sea. This province comprehends the ancient countries of Margiana N. and Ariana S. Its length is estimated at 450 miles, and its breadth at 420. This country was comprehended within the dominions of Timur Béc, who conquered it in 1396, and granted it to his son Mirza Charóc, together with Mazanderán and Segeftán. Its capital is Herat.

KHOREFÁKAN, a sea-port of Arabia, in the province of Oman, situated in the bottom of a bay of the Arabian gulf, which is only open to the east. On the S.E. side is a harbour for boats. The town is now in a reduced state, consisting mostly of fishermen's huts, with few houses of stone. N. lat. $25^{\circ} 15'$. E. long. $56^{\circ} 14'$.

KHORREMAHÁD, or **CURREMAHÁD**, a town of Persia, in the province of Irak, situated on a river which runs into the Karasú; 200 miles W.N.W. of Isfahan. N. lat. $34^{\circ} 35'$. E. long. $48^{\circ} 5'$.

KHOSCIAH, a town of Arabia, in the province of Hedzsás; 26 miles S.W. of Medina.

KHOUD, a town of Hindoostán, in Orissá; 35 miles S. of Koonjoór.

KHUNTIJANT, a town of Hindoostán, in Guzerat; 20 miles N. of Surat.

KIA, a town on the E. coast of the island of Gilolo.

KIAB, a town of Persia, in the province of Chusistán, on the Karasú; 120 miles N. of Basíra. N. lat. $32^{\circ} 30'$. E. long. $47^{\circ} 40'$.—Also, an Arabian tribe, called also by the Persians "Isjeb," who inhabit the furthest point upon the side of the Persian gulf. The territory of this tribe extends from the desert of Arabia to the country of the Hindian, and northward to the principality of Havísa. It is watered by several rivers, large and small. It abounds in dates, rice, grain, and pasture. Its principal cities are Dameh, lying within Persia, Hafar, and Ghoban, the seat of a sheick, near one of the mouths of the Euphrates.

KIA-KING, a city of the first rank in China, in the province of Tche-kiang. This city is large and populous, and carries on a good trade; its suburbs are extensive, and over the canals and ditches are several bridges, and there is not a house in the town, in which silk-worms are not bred. Canals are cut through all parts of the town; and its streets are ornamented with beautiful piazzas, which shelter passengers from the sun and rain. There are many triumphal arches within and without the city, and 15 marble towers on the sides of the canal that lies to the west of the city, by which all the barks pass. Seven cities of the third class are dependant upon it. N. lat. $30^{\circ} 50'$. E. long. $120^{\circ} 14'$.

KIAKILUMA, one of the final Japanese islands. N. lat. $29^{\circ} 50'$. E. long. $132^{\circ} 12'$.

KIAKTA, or **KIACHTA**, a town of Russia, in the government of Irkutsk, situated on a small river which runs into the Selínga: one of the places open, between the courts of Peking and Petersburg, to private trade between the subjects of both nations; the other is Tzuruchatu, or Za-

ruchaitu, on the Argunia; according to a treaty, settled at Kiakta, in 1728. In 1762, the empress abolished the imperial monopoly, and laid the fur trade open; since which time, no caravans have been sent to Peking, and Kiakta is become the centre of the Russian and Chinese commerce; 60 miles S. of Selengiafsk. (Coxe's Russian Discoveries, p. 220.) Kiakta contains about 150 houses, inhabited solely by merchants and commissaries. Opposite to it, about 120 yards distant, lies the Chinese village of Maimatschin, containing about 200 houses. Kiakta is reckoned the third trading city in Russia, and stands 408 versts S. of Irkutsk, and 1532 from Peking, on a small stream of the same name. The following goods are exported free of duty; viz. all sorts of paper, Russian cloth (except the common cloth used by peasants), and spirits distilled from fruits. Goods imported, which are duty free, are raw and dyed wools, glass-coral, false pearls, white lead, fans, sewing needles, printed cottons, ginger, confectionary, rice, toys, musical and other instruments, porcelain, earthen ware, lacquered and enamelled goods, furniture, and ornamental articles. The exportation of arms, warlike stores, powder and lead, specie, gold and silver in ingots, stallions and mares, hides, beaver-hair, pot-ash, resin, and hemp-yarn, is prohibited; as is also the importation of salt, spirits, poisons, and copper coin. Since the year 1754, the merchants of European Russia, who traded with Kiakta, were allowed, on account of the distance, to pay the duties there by giving drafts. An order in 1794, extended this privilege to the Siberian merchants likewise, under the following conditions; the drafts must be given on Irkutsk, Tobolsk, Moscow, or Petersburg, and made payable there. Nine months' payment was allowed, but 10 per cent. per annum were claimed by the crown for this allowance. The drafts must be drawn according to a particular form, and guaranteed. The most important articles of trade are peltry, partly imported to Petersburg from North America, particularly Canada, Russian manufactures, viz. hides, leather, coarse cloth, Russia leather, Muscovian woollens and silks, linen, metal and glass wares, and singhafs; provisions, viz. sheep and cattle, salt meat, &c. and tallow and glue, foreign manufactures, particularly fine cloths. The principal articles imported, are fine silver in stamped bars; raw and wrought silk; raw and manufactured wool; tea; rhubarb, porcelain, tobacco, provisions and preserved fruits. The manner of conducting the commerce of Kiakta is as follows. Barter is the grand medium. The Chinese come to the Russian warehouses, where the samples are laid out, previously to make their assortments. Bargains are often struck on the spot, but generally the Chinese go to the merchants' houses to settle their business. At first the Russians state what Chinese goods they will take in exchange; then the price is accurately fixed by both parties; and when they are agreed, they return to the warehouse, where the Chinese puts his seal on the bales, and sometimes on the whole stock. Then the Russian goes to the Chinese, examines the goods which he is to receive in exchange, and if they answer the contract the barter is concluded. For the conveyance of this merchandize the Chinese mostly use camels, but sometimes two-wheeled carts. When the caravans cross the desert in winter, they carry with them tents made of felt; but in summer they have balagans, made of reeds, which fold up and are put into a case. When the balagans are fixed, and covered with sail-cloth, two persons can sleep in one of them very commodiously. All the Chinese who trade to Kiakta understand the Mogul language, which is also spoken by the Russian merchants.

The

The state of the trade at Kiakta, from 1793 to 1797, was as follows:

Imports	- - 2,546,825 rubles
Exports	- - 2,543,785
Total	- 5,090,610

Zuruchaitu, another mart of the Russian and Chinese trade, though much inferior to Kiakta, is seated on the river Argun, and lies 1326 versts east of Irkutsk. When the Mogul troops are quartered on the frontiers during the summer, this place carries on a trifling bartering trade in articles of primary necessity, which are not worth the detail, as the trade is sunk almost to nothing. From 1793, to 1797, the imports and exports amounted only to 724 rubles; whereas from 1773, to 1777, they amounted to 2985 rubles.

KIALEK, a town of Persia, in Adirbeitzan; 50 miles N.W. of Urmia.

KIAM, a town of Egypt, on the right bank of the Nile; 20 miles S. of Girgê.

KIANGARI, a town of Natolia, and chief place of a sangiacate, defended by a castle on a rock; 256 miles E.S.E. of Constantinople. N. lat. $39^{\circ} 54'$. E. long. $34^{\circ} 17'$.

KIANG-NAN, a province of China, reckoned to be the most fertile, commercial, and opulent in the whole empire. It is bounded on the W. by the provinces of Honan and Hou-quang; on the S. by Tche-kiang and Kiang-si; on the E. by the gulf of Nan-king; the rest borders on the province of Chan-tong. The emperors long kept their courts in this province; but they have since made choice of Peking, because it is nearer to Tartary. This province is of vast extent, and contains 14 cities of the first class, and 93 of the second and third. These cities are very populous, and places of trade. Large barks can go to them from all places, because the whole country is intersected by lakes, rivers, and canals, which have a communication with the great river Yang-tse-kiang, or Kian-kou, which runs through the middle of the province. Silk stuffs, lacquer-ware, ink, paper, and, in general, every thing that comes from Nan-king, as well as from the other cities of the province, are much more esteemed, and fetch a higher price, than those brought from the neighbouring provinces. In the village of Chang-hai alone, and the villages dependent upon it, there are reckoned to be more than 200,000 weavers, of common cotton cloths. The manufacture of these affords employment to the greater number of the women. In several places on the sea-coast there are found many salt pits, from which salt is distributed over the whole empire. Upon the whole, this province is so abundant and so opulent, that it brings every year into the king's treasury about 32,000,000 taels, a tael being equal to an ounce of silver, worth, in China, about six shillings sterling; exclusive of the duties upon exports and imports. The inhabitants, who, according to the estimate of sir George Staunton, amount to 32 millions, are ingenious and docile; and hence many of them become eminent in literature, and rise by their abilities to offices of importance. This province is divided into two parts, each of which has a distinct governor. The governor of the eastern part resides at Sou-tcheou, that of the western at Nan-king, which is the capital of the province. Grofier.

KIANG-NING. See NAN-KING.

KIAN-FE, or TCHIANG-FE, a town of Thibet, near a river which runs into the Sanpoo. It is represented as a fine city with a fortress, and a convent, so extensive, as to

have the appearance of another city; 25 miles S.W. of Lassa. N. lat. $29^{\circ} 58'$. E. long. $90^{\circ} 4'$.

KIAN-KU, KIAM, *Kiang*, or *Yang-tse-kiang*, one of the two great rivers of China, (the other being *Hoan-ho*, or *Hoang*, which see,) rises in the vicinity of the sources of the Hoan-ho; but according to the received accounts and maps about 200 miles further to the west, and winds nearly as far to the south as the Hoan-ho does to the north. After washing the walls of Nan-king, it enters the sea about 100 miles to the south of the Hoan-ho. The Kian-ku is known by various names through its long progress; and near its source is called by the Eluts Porticho or Petchou: the course is about equal to that of the former, these two rivers being considered as the longest on the face of the globe: they certainly equal, if they do not exceed, the famous river of the Amazons in South America, and the majestic course of the Ganges does not extend half the length. In the late embassy of lord Macartney, the length of the Kian-ku is estimated at about 2200 miles; and it is observed, that these two Chinese rivers, taking their sources from the same mountains, and passing almost close to each other, in a particular spot, afterwards separate from each other to the distance of 15° of latitude, or about 1050 British miles; and finally discharge themselves into the same sea, comprehending a tract of land of about 1000 miles in length, which they greatly contribute to fertilize. To these great rivers many important streams are tributary. Pinkerton.

KIANG-SI, a province of China, bounded on the N. by that of Kiang-nan, on the W. by Hou-quang, on the S. by Quang-tong, and on the E. by Fo-kien and Tche-kiang. The country is very fertile, but it is so populous, that it can scarcely supply the wants of its inhabitants. The mountains of this province are covered with medicinal plants and trees, and contain in their bowels mines of gold, silver, lead, iron, and tin. The rice of this country is delicate, and several barks are loaded with it every year for the court. The porcelain, made principally at King-te-ching in this province, is the finest and most valuable of the empire; and the wine made from this rice is reckoned delicious by the Chinese. The river Kan-kiang divides the whole province into two parts; and it contains 13 cities of the first class, and 78 of the second and third. The capital is Nau-tchang. The population of the province, according to sir George Staunton's statement, is 19,000,000.

KIAO-KE, a town of Corea; 72 miles W. of King-ki-tao.

KIAO-TAO, a small island of China, in the Hoan-ho, or Yellow river, near the coast of Corea. N. lat. $38^{\circ} 13'$. E. long. $124^{\circ} 25'$.

KIARE, a town of Persia, in the province of Irak; 30 miles S.W. of Casbin.

KIA-TCHUEN, a town of Corea; 27 miles S.S.W. of Sing-tcheou.

KIA-TING, a city of China, of the second class, in the province of Se-tchuen, on the river Yang: great quantity of musk is collected in the environs of this city. N. lat. $29^{\circ} 29'$. E. long. $103^{\circ} 30'$.

KIAUTEN, a town of Prussian Lithuania, situated in a mountainous country, with an iron foundery, and a large manufacture of paper.

KIAYA-BEY, an officer in the Ottoman empire, who is the lieutenant of the visir, and momentarily discharges his functions when the latter happens to die. All affairs pass through his hands before they arrive at the visir, and all orders emanating from the Porte receive their execution through the impulse of the kiaya-bey. He is appointed by the grand signior, on the presentation of the visir. He

is generally involved in the disgrace of his principal, and if he do not lose his head as frequently as the other, his fortune always, in that case, runs the greatest risk. Although he has no military rank, it may be said that he occupies the second administrative place in the empire, considering the importance and multiplicity of his functions. If the sultan be dissatisfied with his services, he receives, on quitting his office, the dignity of simple visir, or pacha with three tails. It seldom happens that he is given only the two tails when he is sent to govern a province. See *Bay*.

KIBBIED, in *Geography*, a town of Africa, in Bornou; 150 miles S.E. of Bornou. N. lat. $18^{\circ} 23'$. E. long. $24^{\circ} 16'$.

KIBES. See *CHILBLAIN*.

KIBITKA, a travelling carriage in Russia, which is a small cart capable of containing two persons abreast, while the driver sits on the farther extremity close to the horses' tails. It is about five feet in length, and the hinder half is covered with a semi-circular tilt, open in front like the top of a cradle, made of laths, interwoven and covered with birch or beech-bark. There is not a piece of iron in the whole machine. It has no springs, and is fastened by means of wooden pins, ropes, and flicks to the body of the carriage. The Russians, when they travel in these kibitkas, place a feather-bed in the bottom, admirably calculated to break the intolerable jolts and concussions occasioned by the uneven timber roads. With this precaution, a kibitka, though inferior in splendour, equals in comfort the most commodious vehicle. The traveller stretches himself at length upon the feather-bed; and, if inclined, may dose away the journey in perfect tranquillity.

KIBOLA, in *Geography*, a town of Mingrelia; 25 miles S.E. of Anarghia.

KICKAPOO, a town of America, in the Western territory. N. lat. $40^{\circ} 20'$. W. long. $87^{\circ} 10'$.

KICKAPOUS, an Indian nation, whose different tribes inhabit near the entrance of lake Superior, where, some years ago, they had 400 warriors; some reside at lake Michigan, and between that and the Mississippi, near the Outagamies, &c.; and another tribe near the Piankeshaws, and on the Wabash and its branches. The Kickapous and Kaskaskias, two Indian nations lately hostile, ceded lands to the United States at the treaty of Greenville, Aug. 3, 1795. See *KASKASKIAS*.

KICKEMNIT, a river of America, being the north-western arm of Mount Hope bay; about two miles long, and half a mile broad. North-west of it lies the town of Warren, in the state of Rhode island.

KICKER, in *Agriculture*, a term applied to such horses as have the habit of kicking: this should be particularly guarded against in the rearing and managing of young horses, especially those intended for team labour.

KICKER against the Spurs, in the *Mancege*. See *RAMINGUE*.

KICKTOOL, in *Geography*, a town of East Greenland. N. lat. $61^{\circ} 15'$. W. long. $45^{\circ} 5'$.

KICYDANI, a town of Lithuania, in the palatinate of Wilna; 48 miles N.N.W. of Troki.

KID, a small island near the western coast of Ireland, a little N. of Broadhaven; 3 miles S.W. of Browy Head.

KID, a name applied to the young of the goat kind. See *GOAT*.

KID, in *Rural Economy*, a small faggot of under, or brush-wood.

KIDARNAUT, in *Geography*, a town of Thibet; 100 miles N. of Sirinagur. N. lat. $32^{\circ} 4'$. E. long. $79^{\circ} 12'$.

KIDDER, RICHARD, in *Biography*, a learned English prelate, of whose early life no account has come down to

us. In the year 1649, he was sent to Emanuel college, Cambridge, where he took his degrees. Two years afterwards, he was incorporated at the university of Oxford. He was presented by his college to the vicarage of Stratground, in Huntingdonshire, from which he was ejected for non-conformity, under the Bartholomew Act, in 1662. Either the fear of suffering, or some other motive, soon brought him back to the bosom of the church, and he was, in 1664, presented by the earl of Essex to the rectory of Raine. Here he continued about ten years, esteemed by his connections, and in high reputation for learning, particularly for his extensive and deep knowledge of the oriental languages. In 1674, he became rector in the metropolis, and, in 1681, he obtained a prebendary in the cathedral church of Norwich, which was succeeded by his nomination to the deanery of Peterborough in the year 1689. About this period he took his degree of D. D. and in 1691 he was consecrated bishop of Bath and Wells. In 1693, he preached the lecture founded by Mr. Boyle, and afterwards inserted his sermons on that occasion in his "Demonstration of the Messiah," of which work they constitute the first three chapters in the second part. The bishop continued his labours as an author till he was unhappily killed in his bed, together with his lady, by the fall of a stack of chimnies in his palace at Wells, during the great storm in the night of Nov. 26th, 1703. He was esteemed one of the best divines in his time. His largest work, next to that already mentioned, was "A Commentary on the Five Books of Moses, with a Dissertation concerning the Author or Writer of those Books, &c." in 2 vols. 8vo. Bishop Kidder was author of "The Life of Dr. Anthony Horneck," 1698: "Critical Remarks upon some difficult Passages of Scripture in a Letter to Sir Peter King," 1719, a posthumous publication; several practical treatises; tracts on the Popish controversy, &c. *Biog. Brit.*

KIDDERMINSTER, in *Domesday Book* written *Chideminster*, in *Geography*, a market town and parish in the hundred of Halfshire, and county of Worcester, England, is seated on the river Stour, at the distance of 13 miles of Worcester, and 126 N.W. of London. In the year 1800, the town contained 1695 houses, and 8036 inhabitants, the majority of whom were dependant on, or connected with, the manufactures of the place. In the time of king Henry VIII. Kidderminster was noted for its manufactures, first of broad cloths, afterwards of wolfseys, and subsequently of bombazines, crapes, and poplins. But early in the last century the carpet business was introduced here, and has been continued, with increasing success, up to the present time. In the year 1772, the town and its suburbs contained no less than 250 looms, and since that time a larger number has been employed. At first, the carpets made here were of the Scotch and flat species; but soon the cut carpets were invented, and this kind has since continued to be the distinguished class of Kidderminster. By sundry charters from Henry II, Richard II, Henry VI., and Henry VIII., the inhabitants are granted an exemption from toll, postage, and murage throughout the whole kingdom; all these privileges are also confirmed by a charter from queen Elizabeth. In this town the lord of the manor, or his deputy, occasionally holds a court-leet, principally for the prevention of encroachments and public nuisances; here is also a court of request for recovery of debts under forty shillings. No county-justice has a right to exercise any judicial authority in this town, which is governed by a recorder and bailiff; the latter is annually elected by his brother aldermen, twelve in number, with the concurrence of twenty-five common-council-men, who collectively are enabled by charter 12 Charles I.

to make by-laws for the government of the body-corporate and the trade of the town. It formerly sent members to parliament. A market is held on Thursdays for all sorts of grain; but this article is now chiefly disposed of by sample: here are four annual fairs. The church, a large structure of great antiquity, is capable of containing more than two thousand persons. In the choir are several ancient monuments belonging to the Bonnts and Cookseys; also a cross-legged effigy of the late sir Thomas Acton. The tower is a strong and lofty pile. The grammar-school, to which all the inhabitants have the privilege of sending their children free of expence, is at the east end of the choir of the church: the preceptors, one described in the charter as the high, the other as the low master, are elected by certain feoffees, to which the consent of the bishop is always necessary: their annual stipend, upwards of 150*l.*, arises from buildings and lands with which the school is endowed. The town-hall, which is principally constructed of brick, is roomy and elegant: a portion of the lower part is used as a prison, but to the credit of the town, it is very rarely occupied: on what is called the ground-floor are erected stalls for the butchers: and, above is the council-chamber for transacting the business of the corporation. Kidderminster, by the late inland navigation, has communication, by the junction of the Severn canal, with the rivers Mersey, Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Avon, &c.; which navigation, including its windings, extends above five hundred miles. The river Stour rises in the celebrated groves of the Leasowes, near Hales Owen, distant from hence about twelve miles, and after forming a large reservoir at a village called Cradely, proceeds through Stourbridge, Kinver, and Wolverley, and enters Kidderminster on the north side, tracing nearly its whole length, and thereby dividing it into two unequal parts. Over this little river, whose length is not more than twenty miles, part of which was once navigable, are now erected a great number of forges, sitting-mills, corn-mills, and other works of considerable utility: and to the fitness of its waters to the purpose of dyeing is attributed, in a considerable degree, the unequalled lustre of the colours of the yarn used in the several branches of the weaving manufactory here, which, on this account, is justly esteemed an inexhaustible source of wealth to the inhabitants. The Staffordshire and Worcesterhire canal, completed in the year 1774 at the expence of 105,000*l.*, crosses the Stour within one hundred yards from Kidderminster market-place. In this town are three respectable reading societies for cultivating the taste of the wealthier inhabitants; and the instruction of the poor is not forgotten; for, exclusive of several Sunday schools, no less than eight charity schools are established. Here are also twelve almshouses, and other charitable endowments. At Round-hill, in this town, is a chalybeate spring of great medicinal virtues; and in the vicinity are several others, of which that at Sandburn is the strongest. British Directory, vol. iii. The name of Baxter was long held in veneration in this town. See his article.

KIDDERS, those that badge or carry corn, dead victuals, or other merchandise, up and down to sell: every person being a common badger, kidder, lader, or carrier, &c. says the stat. 5 Eliz. cap. 12. And they are called kiddiers, 13 Eliz. cap. 25.

KIDDLE, or KIDEL, *Kidellus*, a dam or weir in a river, with a narrow cut in it, for the laying of pots, or other engines to catch fish.

The word is ancient; for in Magna Charta, cap. 24. we read, "omnes kidelli deponantur per Thamesiam & Medweyam & per totam Angliam, nisi per colteram maris." And by king John's charter, power was granted to the city

of London, "de kidellis amovendis per Thamesiam & Medweyam." A survey was ordered to be made of the weirs, mills, flanks, and kidells, in the great rivers of England, (1 Hen. IV.) Fishermen of late corruptly call these dams *kettles*; and they are much used in Wales, and on the sea-coasts of Kent.

KIDDOW, in *Ornithology*, the most common English name of the *lomvia*, a web-footed bird, common on our shores, and called in different places the guillemot, or guillem, and the sea-hen and skout. See COLYMBUS *Troile*.

KIDED, in *Agriculture*, a term provincially applied to the pods of beans.

KIDELIA, in *Geography*, a town of Russia, in the government of Viborg, on the N. coast of lake Ladoga; 48 miles N.N.E. of Kexholm.

KIDEROW, in *Rural Economy*, a term that signifies a place for keeping a sucking-calf in.

KIDES, in *Geography*, a town of Sweden, in the government of Kuopio; 83 miles S.E. of Kuopio.

KIDGE, a fortified town of Persia, in the province of Mekran. N. lat. 26° 30'. E. long. 61° 10'.

KIDNAPPERS, CAPE, a cape on the E. coast of New Zealand, discovered in 1769, and thus named by captain Cook, from an attempt made by the inhabitants to carry a boy from the Endeavour. It is remarkable for two white rocks like hay-stacks, and high white cliffs on each side. S. lat. 39° 43'. W. long. 182° 24'.

KIDNAPPING, in *Law*, is the offence of a forcible abduction or stealing away of a man, woman, or child, from their own country, and sending them into another. This offence was capital by the Jewish law. (Exod. xxi. 16.) So likewise in the civil law, the offence of spiriting away and stealing men and children, which was called "plagium," and the offenders "plagiarii," was punished with death. (Ff. 48. 151.) This is unquestionably a heinous crime, as it robs the king of his subjects, banishes a man from his country, and may in its consequences be productive of the most cruel and disagreeable hardships; and, therefore, the common law of England has punished it with fine, imprisonment, and pillory. (Raym. 474. 2 Show. 221. Skin. 47. Comb. 10.) Also, if a master of a ship shall, during his being abroad, force any person ashore, or wilfully leave him behind, or refuse to bring home all such men as he carried out, if able and desirous to return, he shall suffer three months imprisonment. 11 & 12 W. III. c. 7.

KIDNEY, in *Anatomy*, a glandular body, situated in the abdomen, and secreting the urine.

The urinary apparatus consists of two secretory organs (the right and left kidneys), by which the urinary fluid is separated from the blood; of two membranous tubes (the ureters) by which this fluid is conveyed into a large musculo-membranous reservoir (the urinary bladder); and of a canal (the urethra) by which this reservoir is evacuated at various intervals. The latter conveys the seminal fluid also in the male subject, and is therefore described in the article GENERATION. The different arrangement and conformation of the female generative organs occasion the urethra to assume a very different form; it is here entirely unconnected with the generative functions, and we shall therefore describe it in the present article with the bladder.

The essential parts of the urinary apparatus correspond nearly to those of the biliary organs; but there are some remarkable differences. The liver is always a single organ. There are almost constantly two kidneys. The proportions of the secretory organ and the reservoir are inverse in the two cases: the liver is so large as to exceed probably all the other glands in the body put together: the gall-bladder

KIDNEY.

is comparatively small: in the other case, the capacity of the reservoir considerably exceeds the size of the glandular organs. A part only of the bile passes into the gall-bladder, the remainder flowing directly into the duodenum: and this secretion seems not to be very active in the intervals of the digestive process. The kidneys, on the contrary, are always active, and the whole of the fluid which they separate passes into the urinary bladder.

Two small bodies, placed near the kidneys, and called the renal capsules, receive their vessels for the most part from the renal: we shall therefore unite their description with that of the kidneys.

The kidneys are placed deeply in the lumbar regions, at the sides of the vertebral column. They are usually two, a right and a left; but the number is exposed to occasional unimportant variations. Sometimes the two are united by their upper or lower extremities, so as to form a crescent, with the concavity upwards or downwards, something like the figure of a horse-shoe, from which the gland, in these cases, is sometimes named: or, there may be an unusually large one on either side, with two ureters, and a deficiency of the opposite gland: or, a small supernumerary kidney on the front of the vertebral column. Other deviations from the accustomed structure have been registered by anatomists; but all these varieties are unimportant in physiology.

They are surrounded by a large quantity of fat, of a peculiar structure and properties. This substance is contained in a loose and easily lacerable cellular texture, which connects it to the kidney; it forms a complete case, isolating these organs from the surrounding parts. Its quantity varies remarkably in different subjects, being so abundant as to hide the organs where the individual is very fat, and very sparing in the opposite state. This fat is remarkable for growing hard when it is cold, particularly in the ruminating herbivorous animals, where it is distinguished by the name of suet.

On account of the different bulk of the liver and spleen, the two organs, which are placed immediately above the kidneys, the latter are somewhat differently situated on the two sides of the body, the right being rather lower than the left: the difference in this respect may amount to an inch, but it is not constant. They both lie deeply buried behind the abdominal viscera; the right having above it the renal capsule and the liver, and in front the colon and cæcum, the duodenum, and the other small intestine; the left being covered by the spleen and pancreas, stomach, colon, and small intestine.

The figure is justly compared to that of the kidney bean, with the concavity placed inwards. It is elongated from above downwards, convex in the greatest part of its circumference, and rather broadest at its upper end. The size varies considerably, from four ounces in the adult to five, six, or even a pound: often one is considerably larger than the other.

In order to describe more exactly the external form and the relations of the kidney, we divide it into two surfaces and a circumference. The anterior surface is slightly convex: sometimes completely covered by the peritoneum, with the intersection of a stratum of variable thickness of fat and loose cellular substance; and sometimes in more or less immediate contact with the corresponding part of the colon: for in some subjects the membrane simply passes in front of the intestine, and binds it to the kidney, while in others there is a more or less loose fold, called the lumbar mesocolon. From the right kidney the peritoneum rises to the liver above, and even to the diaphragm; below, it passes

to the colon and duodenum; on the left side it goes to the colon and spleen. Cellular substance, containing more or less fat, always connects the front surface of the kidney to the membrane; so that the gland is behind the cavity formed by that membrane, and would not be enumerated among the abdominal viscera, if that epithet were confined to the parts contained within the cavity of the membrane.

The posterior surface is nearly plane, and rests on a thick layer of fat, which separates it from the lower part of the diaphragm, from the anterior layer of the aponeurosis of the transversus, where it covers the quadratus lumborum, and from the psoas magnus.

Thus, there is placed behind the kidney the thick mass of soft parts, which extends from the pelvis to the chest, protecting the organ from all external injury, and rendering it nearly inaccessible to the knife of the surgeon. It is also supported behind by the two or three last ribs. In its longitudinal direction it corresponds nearly to the two last dorsal, and the two neighbouring lumbar vertebrae.

The circumference of the kidney presents a thick and rounded extremity above, covered by the concave basis of the renal capsule; a thinner and more elongated end below, approaching more or less nearly to the crista of the ilium: a convex, thick, and rounded edge, turned outwards, and corresponding to the muscular parietes of the abdomen and the diaphragm; a deep excavation on the inside, called the notch of the kidney. This notch has thick and rounded edges, and contains some fat. The divisions of the renal artery occupy the upper and front part, those of the vein are placed behind: the pelvis occupies the deepest portion, and the commencement of the ureter is seen below.

The consistence of the kidney is remarkably firm, exceeding, in this respect, all other glandular organs. Its colour is reddish, with a tinge of brown; but the intensity varies according to the quantity of blood contained in the vessels. When an animal has died of hemorrhage, it is quite pale. The structure of the organ comprehends a peculiar glandular tissue, arteries, veins, lymphatics, nerves, excretory tubes, and a peculiar membrane.

The proper tissue of the kidney is remarkable for its firmness. It will be best understood by carrying a section through the kidney, so as to divide it into an anterior and a posterior half. We shall then be able to distinguish very clearly two substances; an exterior, which is called the *cortical* or *arterial*, and an interior, named the *tubular* or *uriniferous*. All kidneys are not equally well suited for this examination: in some, without any alteration from disease, the two substances are confused together. The contrast of the two component parts is seen particularly clearly after minute injection.

The section of the kidney presents to us also, disposed in a still more deeply seated stratum than the tubular part, a series of small bodies, called *papille* or *mamille*, which are merely the apices of the small cones formed by the tubular substance. Many anatomists describe these as a third substance, under the name of the *mamillary*. Lastly, we observe the infundibula or calyces, and the pelvis, besides the orifices of divided vessels scattered here and there.

The cortical substance is so named because it covers the exterior surface of the organ: it is about two lines in thickness. Its colour is a palish red, inclining to yellow: its consistence is less firm than that of the tubular, and is about the same with that of the liver, so that it may be torn easily. It is smooth externally, and closely connected to the proper membrane of the kidney. Internally it is continuous with the tubular substance, and it forms prolongations

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tions which fill the intervals of the different portions of the tubular matter. These septa have been called the fleshy columns of the kidney : they grow thinner as they approach the pelvis, round which there is always found some adipous substance. Their number depends upon that of the papillæ. The renal arteries are distributed almost entirely to the cortical substance : injections thrown into these vessels penetrate it most easily, and colour it throughout : hence it has been concluded to be of a nature entirely vascular. Some anatomists have admitted the existence of very small glands in this substance, connected to the blood-vessels as grapes are to their stalks ; these are technically named acini. On tearing the cortical substance, small granulations are observed on the torn surface, and minute granular bodies are seen in great abundance throughout this part of the kidney, where it has been minutely injected. These are considered as the glands in question, while some contend that they are only convoluted blood-vessels. For an account of the controversy on this matter, see GLAND. The minuteness of the objects does not allow us to arrive at a satisfactory conclusion concerning their intimate structure.

The tubular or uriniferous, called also the striated substance, is lighter in its colour, more dense and solid than the cortical. Injections do not penetrate it, but leave it in general quite colourless. It is composed of a vast number of small tubes (tubuli uriniferi) united into conical fasciculi of unequal size. The rounded bases of these fasciculi are turned towards the exterior of the kidney, and present diverging striæ, which are lost in the cortical substance : their apices are directed towards the notch. These fasciculi are every where surrounded by the cortical substance, except at their apices, which are embraced by the infundibula. Each of these points forms a conical papilla, pierced by numerous small apertures, which are the openings of the tubes just mentioned.

The papillæ, therefore, are simply the points of the cones which constitute the tubular substance : their number varies from five to eighteen. Generally there is a single papilla for each cone ; sometimes two cones are united by one papilla, which is then larger ; two papillæ are very seldom found on one cone. Their form and length are very various ; they may be short and rounded, or long and pointed. They are of a tolerably bright red colour, but sometimes rather pale, while the rest of the tubular substance is redder, or even of a violet hue at the bases of the cones. Their surface is smooth, soft to the touch, and probably covered by a fine membrane. The orifices of the uriniferous tubes are seen on it, and as these are much less numerous than the striæ of the tubular substance, probably several of the fine tubes unite together before they terminate. Compression of the kidney causes the urine to transude at these pores ; and the urine may be expressed in like manner, when the papillæ have been divided by a section perpendicular to the course of the tubes.

From the preceding description of the two substances which compose the kidney, it appears, that the cortical performs the secretion, and that the tubular, completely unconcerned with this function, has the office of transmitting the secreted fluid. Thus it differs from all other glands of which the component substance is identical throughout.

That the arteries of the kidney are entirely distributed in the cortical matter is evident from anatomical injections : the exact mode in which they are connected to the uriniferous tubes hardly admits of being unravelled. The arteries seem to be continued towards the cones, where they are joined to the cortical matter, and injections often pass from them into the uriniferous tubes, which are then

seen running in straight lines, and converging towards the papillæ. Ruysch and others found that water, quicksilver, suet, wax, and air, thrown into the renal arteries, would come out at the pores of the papillæ, which is a strong argument for the existence of continuous tubes. A further proof of the same circumstance has been drawn from the passage of actual blood in many instances by the urinary passages.

The basis of each papilla is embraced by a small membranous tube, into the cavity of which the apex projects. These calyces, or infundibula, are surrounded externally by some fat, and are less numerous than the papillæ, because two or three of the latter are sometimes furnished with a single tube. They are collected ordinarily into three trunks, which come respectively from the upper, middle, and lower parts of the kidney. These three trunks open at the notch into the pelvis : sometimes a greater number of branches opens into this membranous bag. The pelvis is placed at the deepest part of the notch, behind and between the divisions of the renal artery and vein. It is most capacious in its middle, narrower at the two ends, and continued below into the ureter. The openings of the trunks formed by the union of the calyces, and of the ureter, are observed on its inner surface. These are simple openings without any valvular apparatus. Sometimes there are two pelvises to a single kidney.

The pelvis and calyces are composed of a firm, white, and opaque membrane, connected by a loose cellular texture to the surrounding organs, and having a smooth mucous surface internally, continuous with that of the ureter, and with the covering of the papillæ. Its structure is dense, and not very vascular : of its properties and action we know nothing. Bichat and Boyer distinguish three strata in this membrane ; an exterior, derived from the capsule of the kidney ; a middle, or proper membrane, continued at the bases of the papillæ into the substance of the organ ; and an internal, or mucous coat.

The arteries and veins of these glands will be described in the articles concerning those vessels ; we have only to point out a few circumstances here concerning them. The renal arteries arise nearly at right angles, and pass through a short course before they arrive at their destination. Their diameter is very considerable in proportion to the volume of the organ. It is shewn by some calculations, the results of which cannot be received with very implicit confidence, that one-fourth or one-third of the blood of the abdominal aorta goes to these glands, consequently, a very large proportion of the whole mass. Hence the whole of the blood will have passed through the kidneys in a few pulsations of the heart. They are covered and accompanied by the renal veins ; both vessels divide near the kidney into several branches, which enter the notch and penetrate into the organ, accompanied by nerves and lymphatics. All these parts are surrounded by a loose cellular tissue, continuous apparently with that contained in the notch. The proper membrane of the kidney adheres to these fasciculi. The large branches occupy the intervals of the papillæ, and follow a winding course round the cones ; the smaller ramifications form arches in the cortical substance, from the convexity of which numerous ramifications are distributed in that substance. They seem to terminate about the junction of the cortical and tubular parts by uriniferous tubes. The veins have a disposition analogous to that of the arteries.

The lymphatic vessels, distinguished into superficial and deep-seated, communicate frequently. They follow the course of the blood-vessels, pass out at the notch, and go to the lumbar glands.

The nerves, derived from the ganglia of the great sympathetic, constitute the renal plexus, of which the branches surround the blood-vessels, particularly the artery, and penetrate with it into the kidney. The kidneys seem to be hardly sensible in the natural state: but disease, as, for example, inflammation, develops their sensibility in a very high degree.

The external surface of the kidney is closely invested by a peculiar membrane, sometimes called the capsule, which adheres by means of short and very fine threads, but can be separated without much difficulty. It enters the notch, and is connected there to the calyces and blood-vessels. It is very dense and firm, semi-transparent, rather thicker than the peritoneum, and not divisible into laminae. Immersion in boiling water makes it curl up and become thicker.

The ureter is the tube designed to convey the urine from the kidney, commencing from the inner and lower part of the pelvis of the kidney by a wide opening, sometimes called infundibulum, and continued thence in a descending course to the inferior surface of the bladder, where it is not more than an inch distant from its fellow of the opposite side. Its ordinary size is about equal to that of a quill, except towards the lower extremity, where it is slightly contracted; but it varies in this respect in different subjects, and even in different parts in the same subject. Commonly there is one to each kidney, but sometimes it is double.

From its origin it goes obliquely inwards and downwards as far as the front of the sacro-iliac symphysis, where it is separated from the opposite one by the breadth of the basis of the sacrum. In this part of its course the peritoneum and the spermatic vessels lie in front: the psoas muscle, which it crosses at a very acute angle, is behind it. Lower down it crosses the common iliac artery and vein. The right tube lies parallel to the outer side of the inferior vena cava. Several small blood-vessels are distributed on it. At the base of the sacrum it passes forwards, downwards, and inwards through a large quantity of adipous substance, and advances towards the under surface of the bladder. Here it crosses the vas deferens, and is placed a little above and externally to the vesicula seminalis, at which point it penetrates the bladder. It runs obliquely between the coats of that organ, passing for about an inch from without inwards and from behind forwards, between the muscular and mucous coverings, and then opening into the cavity by a very narrow orifice placed at the posterior angle of the triangular space near the neck of the bladder.

The course of these tubes is the same in the female; they present no peculiarities worthy of notice in the pelvis of this sex.

As the ureter is a continuation of the pelvis, we naturally expect to discover in it the same organization as in that bag. Anatomists describe three coats; an exterior, thin, transparent, and of a cellular nature; a middle, which is thicker, and gives to the part its colour and consistence; and an internal mucous covering, continuous with those of the pelvis of the kidney and bladder, and habitually moistened, like them, with a mucous fluid capable of defending it from the action of the urine. These strata are, however, so closely connected, that it is almost impossible to exhibit them distinct. The blood-vessels are derived from the renal, the spermatic, the aorta and vena cava inferior, and the iliacs.

The ureters, as well as the pelvis and calyces of the kidney, are very extensible: their ordinary functions probably require the exercise of such a property, as they must be subject to various conditions of plenitude and emptiness. But disease elucidates this point most clearly: when the

natural passage of the urine is obstructed by a stone, or when it is disturbed by difficulties in the evacuation through the urethra, the ureters are often enlarged very considerably, even in some cases almost to the size of a small intestine, and the pelvis, with its dependencies, undergoes an analogous dilatation.

These parts do not seem to possess animal sensibility in their natural state; but that property is manifested in them to the highest degree, by the passage of a stone, which causes perhaps torture as exquisite as any disease of any organ in the body.

Their function of conveying the secreted urine from the kidney to the bladder, requires the exercise of tonic powers: the idea of this fluid finding its way by the force of gravity, is not only repugnant to the laws of the animal economy, but is irreconcilable with obvious phenomena. The adhesion of the sides of the tube, where it penetrates the coats of the bladder, presents an obstacle, which can be overcome only by the exertion of some force; and this obstacle is vastly increased in the distended state of the bladder, during which the fluid is constantly finding its way into the receptacle. The only power in this case, by which the requisite end can be obtained, is a contraction of the canal.

Development of the Kidney.—In the fœtus all parts of the urinary apparatus are remarkable for their considerable advancement; and some are distinguished by considerable peculiarities of conformation and structure. The kidneys are very large, surrounded at first by a soft and reddish cellular tissue, but covered, before the end of utero-gestation, by a small quantity of granulated fat: this is most abundant behind, so that the peritoneum is almost immediately in contact with them in front. The external surface is tuberculated at this time: anatomists have sometimes described the organ, as if the cones of tubular substance were imperfectly connected together as yet, so that each kidney might be regarded as an assemblage of smaller kidneys. This representation is not correct; no traces of such distinction are visible in the interior; and the tubercles of the outside, which correspond to the bases of the cones, seem to depend on the cortical matter being not completely developed. Some animals, as those mammalia which either live in or frequent the water, have kidneys composed of small kidneys connected by cellular substance. There is in these cases a large number of cones, each surrounded by a stratum of cortical matter, and furnished with a calyx of its own: and these separate pieces are only united by cellular substance. We may conceive the human kidney to be formed in this way, except that the separate portions are blended into one mass: and the distinction is only external even in the fœtus. A structure of a description quite opposite prevails in many other animals, particularly in all the fœæ of Linnæus. The kidney in them consists of a single portion of tubular substance, with one papilla and calyx, and a single stratum of cortical matter.

While the kidney retains this tuberculated exterior, the proportion of cortical matter is smaller than in the perfect gland; but the distinction between it and the tubular is well marked: the papillæ exhibit a very lively red colour. The gland at this time has considerable firmness, particularly if compared to the liver or spleen. The capsule is very perfectly formed, and separates easily. The calyces, pelvis, and ureter are remarkable for their considerable progress: the latter, in particular, is nearly half as large as in the adult, in a fœtus of seven or eight months. Its size may be more accurately estimated if it be compared to the vas deferens, which is like a slender nervous thread, recognizable only by its whiteness.

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No considerable change has taken place at the time of birth: although the kidneys are still tuberculated, their figure is more precisely determined, and the difference of the two constituent parts is strongly marked. There is nothing remarkable about the pelvis or ureter. In the subsequent years fat is collected more abundantly about the kidneys: these organs, by acquiring a thicker covering of cortical matter, lose their unequal surface, and gradually assume the form which characterizes them in the adult. The external membrane becomes more dense, and more closely connected to the surface. The other parts experience no further change except that they partake of the general growth. In old age the kidneys become soft and flaccid; and the surrounding fat is diminished in quantity. The external membrane presents occasionally points of a cartilaginous consistence.

Physiology of the Kidneys.—The minute ramifications of the renal arteries, which compose so great a portion of the cortical substance of the kidneys, separate from the blood the urinary fluid, which is conveyed along the tubuli uriniferi, and deposited by their orifices in the calyces of the kidney. It then goes through the pelvis and ureter, and thus arrives at the bladder. The secretion goes on constantly, and the transmission into the bladder is equally constant: for there is a continual efflux, when a catheter is placed permanently in the bladder, as also in those examples of malformation, where the ureters open on the surface of the body. Ligatures placed on the ureters, or obstructions of those canals by other causes, as, for example, by stones, demonstrate this course of the urine; the tubes are distended between the kidney and the obstacle, and empty below.

That the urine is formed in the cortical substance of the kidney, is the amount of our knowledge concerning this part of the subject; the mode, in which the secretion takes place, is entirely unknown. This is the problem of secretion, towards the solution of which we have approached no nearer than the above general fact since physiology has been cultivated. In the present instance, indeed, it is not yet agreed whether the uriniferous tubes be continuous with the capillary arterial canals, or whether some organ be interposed between them. Hence all attempts to explain the peculiar nature of the urine from the structure of the parts in which it is formed, and to shew how the properties of this fluid agree with the size, direction, curvatures, &c. of the canals, in which the secretion takes place, must be founded on grounds completely chimerical, although these reveries are sanctioned by the respectable authority of Haller. (*Element. Physiol. lib. 26. sect. 4. § 5.*) Another unaccountable error is committed by the same physiologist in his observations on this subject. He asserts that the urine is formed in the blood, and separated only by the action of the kidney; and defends the opinion by stating that this fluid goes off by perspiration, or by the stomach and intestines, when its ordinary passage is obstructed. This notion is completely irreconcilable with the present state of our knowledge concerning the chemical constitution of the blood and the urine; and the alleged facts, by which it is supported, are, to say the least, of a suspicious nature.

We may establish, in the second place, this fact; that the kidneys are the only organs in the body capable of forming urine, and that the ureters are the only passages by which fluids can be conveyed into the bladder. Yet both of these points are contrary to the opinions of some physiologists. When the evacuation of the urine from the body is stopped, some suppose that it is separated by other organs. "It appears," says Haller (*Elem. Physiol. lib. 26. sect. 4.*

§ 12.), "that the friction of the circulation, and the heat of the fluids produce in the blood aerid particles, tending to an alkaline nature, of which the more volatile are dissipated by insensible perspiration, while others, too large for the pores of the skin, can be separated by the kidneys only. For, in all cases of ischuria, where these particles are not separated by the urine, either symptoms of acrimony take place in the whole body, or these matters are thrown off by other organs. Thus the sweat and perspiration have an urinous odour: or there is an urinous oedema of the whole body, or urine deposited in the cellular substance, with violent and fatal fever. In other instances urine has been discharged by the salivary organs; by the ears or nostrils, mixed with blood; by the mammae; by vomiting, or stool; or it has become mixed with the fluid of the abdomen, or it has been deposited in the brain, causing cephalalgia, blindness, delirium, stupor, convulsions and apoplexy. When secreted into the stomach, it causes hicough and vomiting. Lastly, the congestion of earthy substances in the blood, caused by ischuria, may produce sandy matter in the sweat." That a fluid, possessing such very peculiar properties as the urine does, consisting of such numerous and complicated elements, and separated usually in a very intricate glandular structure, should be formed also in almost every other kind of organic apparatus in the body; that it should be separated by the exhalants of the cellular substance, and of the skin, by those of mucous and serous surfaces, by the vessels of the brain, as well as by glandular organs, is a position so completely at variance with all that we understand of the composition and actions of the animal frame, that we could not receive it without very unexceptionable evidence. The whole quotation exhibits credulity rather than the deliberate caution necessary for establishing so singular a fact, and the subjoined authorities are not at all calculated to remove our scruples. Perhaps an urinous odour has been sometimes observed in the perspiration; although we believe that even this has not been hitherto proved by very convincing evidence. Must we immediately conclude that the eutaneous exhalants have formed urine? When the biliary passages are obstructed, and various fluids are tinged with bile, we explain the phenomena by the absorption of that fluid from its natural receptacles. Will not the same explanation suffice for the cases, if there are any sufficiently proved, of urinous properties in the other secretions and exhalations of the body?

That there is some more direct passage from the alimentary canal to the bladder, than through the absorbents, the general circulation, and the kidneys, is an opinion that has been partially entertained even from the most ancient times. The very rapid manner in which the urinary secretion is augmented by copious draughts of fluids, and the communication, within a very short time, of particular properties to the urine, by certain substances taken into the stomach, are the circumstances on which this opinion has been grounded. Anatomical investigation has hitherto detected no such passage; no dissector has met with any tube that could possibly serve the purpose of forming such a communication: while the experiment of tying the ureters corroborates this negative fact, by teaching us that no urine gains admission into the bladder, when these tubes are obstructed. "Galen," says Haller, (*Elem. Physiol. lib. 26. sect. 4. § 4.*) "taught us long ago, that when the ureters are tied or divided in the living body, the urinary bladder is found empty, and that the animal evacuates no urine. This experiment has uniformly exhibited the same result in the hands of several very practised and dextrous experimenters; and Rast lately repeated it on a dog, and found the kidneys swollen and full of

water, the papillæ dilated, the ureters enlarged above the ligature, and empty below, the bladder not containing a single drop of urine." The phenomena of disease confirm the conclusions to which these trials lead: obstructions of the ureters, and suppression of the action of the kidneys, entirely stop the urinary discharge, whatever quantity of fluid the patient may drink.

This assertion of the existence of a short communication between the stomach or bowels and the bladder, against the evidence of anatomy and experiments, is founded on an assumption which we consider to be highly questionable. We are so far from allowing that the absorbents and blood-vessels are inadequate to the explanation of the phenomena, that we believe the very reverse to be true. We believe that the great absorbing surface afforded by the alimentary canal, together with the infinite number of absorbing vessels, and the diameter of the thoracic duct, fully account for the conveyance of fluids into the blood; and that the large size of the renal arteries, which must circulate the whole mass of blood through the kidneys several times in the course of a minute, with the great number of the uriniferous tubes, very satisfactorily explain the secretion of urine in any quantity of which we have examples. If these passages, which are obvious to our senses, and large enough to allow a considerable quantity of fluid to pass through them, cannot transmit the urine with sufficient celerity, how shall we expect that a greater quantity can pass through canals, which must be beyond all comparison smaller, since no dissector even conjectures that he has ever seen them? There is another and still more fatal objection to these opinions: the fluids voided in these cases are urine, of a very aqueous kind indeed, but still urine;—still that peculiar animal fluid, which is secreted only by a kidney. Now, if there be a direct passage from the stomach to the bladder, we ought to void, according to the nature of our drink, tea, wine, punch, cyder, &c. We must suppose, therefore, the existence of an unknown kidney to convert these different fluids into urine, as well as of an unknown passage to convey them to the bladder. The existence in the urine of particular properties, derived from certain articles of food, will prove nothing in this case, until we have been convinced that they cannot have been imported by the medium of the general circulation. Exposure of the body to the vapour of turpentine will affect the urine, without its introduction into the stomach. (See the experiments under the article INTEGUMENTS.) What are the secret passages by which this is conveyed, in such a case?

The urine is regarded as a fluid entirely excrementitious; as consisting of materials, which are either useless in the animal economy, or which, if retained, would be actually prejudicial. The fluids which we drink dilute the solid food, reduce it to that state in which it constitutes the chyle, and are absorbed with it. Probably a considerable portion is taken up immediately from the alimentary canal, without undergoing the previous change into chyle; since copious drinks often augment the urinary discharge much sooner than the formation of chyle could be effected. The superfluous fluid, thus introduced into the blood, is separated by the kidneys, and very speedily separated, when large quantities are drunk: hence the chief component part of the urine is water. The organs of the body are constantly undergoing changes in their composition: they receive fresh particles from the blood, while the absorbing system removes the old ones; so that there is a perpetual movement over the whole body of combination and decomposition. Again, a similar change is incessantly carried on in the animal fluids. The lymph of the cellular texture and the

serum of the circumscribed cavities are at all times in this kind of circulatory motion. These old materials are conveyed into the blood by the absorbents, and separated from it in the kidneys, in order to be thrown out of the body. They separate it under the peculiar form denominated by the French chemists *urée*; which matter exceeds in amount by many times all the other saline substances dissolved in the urine, and bestows on that fluid its colour, odour,—in a word, all its peculiar characters. We shall anticipate, from this view of the matter, what the researches of modern chemistry have most clearly proved, that the component ingredients of urine are very numerous: it exceeds, in this respect, all the other animal fluids. A particular account of its sensible characters and chemical composition will be found under the article URINE; and that of the concretions occasionally formed in the urinary passages under STONE.

No secretion exhibits such signal variations as this: the term urine, therefore, is applied to fluids differing in almost every circumstance from each other. The nature and proportion of its ingredients are not alike in the same individual, at the different periods of life. Peculiar characters distinguish it in the fœtus, the boy, the adult, and the old subject: they differ in the same day, according as a person is exposed to heat or cold, as he is inactive or uses much bodily exertion, according to the nature and quantity of the food and drink, and the length of time after meals at which it is voided; the state of health, particularly of the stomach, and other digestive organs, and the passions of the mind, have also considerable influence.

The kidneys and bladder of the fœtus contain a very small portion of fluid, which can hardly be deemed urine: it is almost entirely aqueous, rather viscid and turbid, and has no smell or taste. In the first years of life, the colour is not deep; the acrid and odorous properties are but slightly marked. As the motion of composition prevails, in almost all the organs, over that of decomposition, the quantity of *urée* is small. The earthy phosphates, particularly that of lime, are not present, or in very minute quantities. While ossification is incomplete, this substance is required for the development of the bony system. In the adult, where the growth of the body is complete, the residue of nutrition is more abundant: all the properties of the urine are more strong. It contains salts, earthy phosphates, phosphoric acid, *urée*, and uric acid, according to the description in the articles already referred to. The salts and the animal substance increase in the old subject; the phosphate of lime is very abundant.

The modifications produced in the urine by heat and cold, which include also the effects of exercise, and the influence of the seasons, are not the result of any direct action on the kidneys, but arise from the operations of these causes on the cutaneous functions. The relations between the urine and the external and internal exhalations are peculiar to this secretion. In proportion as we perspire more abundantly, the urinary evacuation is diminished; and the same circumstance is observed in considerable dropsies. From this character, which belongs exclusively to the function of the kidneys, naturally arise the frequent variations in the quantity of the urine; while the other secretions are nearly always in uniform proportions. Exposure of the surface to cold, or inactivity, is attended not only with an increased quantity of urine, but with alterations of its other properties: it is pale, not acrid, nor strong in its smell. Warmth, with free perspiration, or strong exercise, diminishes the quantity, and renders it more highly coloured, acrimonious, and odorous. Slighter changes of an analogous nature may be remarked in winter and summer. (See INTEGUMENTS.) When the

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quantity of urine is so remarkably augmented in diabetes, the skin is parched and dry.

The quantity of food, and more particularly of drink, influences very greatly that of the urine; and several physiologists represent the two as nearly equal. The effect of aqueous drinks, however, will be considerably modified by the state of the cutaneous discharge. If the individual be warm and strong, a great part of such drinks is dissipated by the skin: in a weaker state of the body, combined with external cold, it is disposed of by the kidneys. The labourers in harvest will often drink some gallons of liquor, while prosecuting their hard work under a hot sun, without any increased urinary discharge; the perspiration, however, is uncommonly copious, and its evaporation has a most favourable effect in keeping the body cool. The liquors which increase the urine most remarkably are those of an aqueous kind, such as water, vegetable infusions, weak beer, cyder, &c. taken cold. Stimulating drinks, such as the stronger wines and spirits, and warm fluids, excite the system in general, and are more likely to be disposed of by the skin. The quantity of urine, ascertained by actual experiment, has varied considerably. The accounts of Hartman, Robinson, De Gorter, Keil, Rye, Home, Sanctorius, and Linings, give us the following numbers of ounces in twenty-four hours; 28, 31, 36, 38, 40, 44, 50½, 64: the average of the whole will be 49 ounces.

The qualities of the urine are affected, in many instances, in a very obvious way by the nature of the food. As this secretion provides for the removal from the body of the residual and excrementitious part of our aliment, we cannot doubt that it must be very essentially influenced by the properties of the food. Rhubarb, beet root, madder, and other substances affect its colour. Fourcroy mentions a man, who conceived that he voided blood, but was perfectly free from pain, and all symptoms of urinary affection. He had eaten a large quantity of beet root for several days; and on leaving this off, the urine recovered its healthy appearance. (*Syst. des Connoiss. Chim. t. 10. p. 170.*) Garlick and onions affect its smell; oil of turpentine gives it an odour resembling that of violets; and asparagus imparts to it a remarkable fetor. Several other vegetables, such as fennel, carrots, parsnips, &c. produce also very sensible effects on its smell. A very striking instance of change in its properties, produced by an alteration in the food, is afforded in the treatment of the diabetes mellitus by animal diet. See DIABETES.

The alteration of the urine by the food is more particularly evinced in individuals, whose digestive organs are not strong: hence the state of the urine is an important symptom in such cases.

Two or three kinds of urine are distinguished, according to the interval between the repast and the time of evacuating the fluid. The first, discharged within a very short time after drinking, is called urine of the drink (*urina potus*), or crude urine. It is often evacuated so soon after drinking, and has so little of the distinguishing characters of urine, that it has given rise to the notion already mentioned of a short communication between the stomach and bladder. It appears almost like a mere water, and has neither the smell, colour, nor weight of urine: it must be regarded as an extremely diluted form of the fluid, in which the urée is diffused in a very large proportion of water. The urine of digestion or concoction (*urina chyli*) is that evacuated two or three hours after a meal. Its colour and other urinous properties are more strongly marked than in the preceding; but it is not yet perfect urine. It is affected by the nature of the food. The urine of the blood (*urina sanguinis*) is

voided seven or eight hours after eating, or in the morning after a night's sleep. It is highly coloured and acrid, has a strong taste and smell, not that imparted by any particular food, but the peculiar urinous odour. The circumstances of digestion and the nature of the food either do not affect this, or affect it in a much less degree. It contains a large proportion of salts and urée. Its characters, in short, are those described as belonging to urine; and it is always selected for the purpose of experiments on the chemical constitution of this fluid.

The passions have an influence on the nature of this fluid: fear, sorrow, and, in general, the emotions which act violently on the frame, often cause an abundant flow of colourless and inodorous urine, which seems to consist almost entirely of water.

But the effects of the causes which we have just considered, are very slight in comparison with the changes produced by disease. The alteration in this case goes deeper, and the variations are more numerous and characteristic. Since the earliest ages of medicine, physicians have drawn indications from this source concerning the nature, progress, and termination of diseases; and empirics have not overlooked so favourable an opportunity of levying a tax on public credulity. Careful analyses of the various morbid urines are still among those desiderata, which promise very interesting results to the physiologist and pathologist. A few facts only have been collected on this subject. The sediment of the urine, at the termination of acute diseases, has been found to consist chiefly of uric acid. The colourless fluid voided in nervous disorders, in hysterical paroxysms, &c. is little more than mere water. Phosphoric acid and phosphate of lime are not found in the urine during the paroxysm of gout; but the latter returns towards its cessation, and is even more abundant than in the healthy state. In those affections, in which the bones become softened, the urine has a large proportion of phosphate of lime: the earth absorbed from the bones is evacuated by the kidneys. During utero-gestation, this earthy salt is not found in the urine. For the remarkable qualities of this fluid in *diabetes*, see that article. The secretions of the mucous membranes, over which the urine passes, may variously modify its properties; and diseases of these parts may occasion the admixture of blood, pus, mucus, &c.

The last circumstance we have to mention concerning the urinary secretion, distinguishes it from all others; *viz.* that the secreted fluid is concerned in no other function, but is entirely expelled from the body, after traversing the urinary passages. In other instances the secreted fluids serve some office; the tears lubricate the surface of the eye; the action of the saliva in assisting mastication is very important; the bile and pancreatic juice concur in digestion. Hence the alterations in the quantity or qualities of these are followed by serious consequences; while the changes of the urine, particularly in quantity, are hardly observed.

The *renal capsules* (*capsulæ suprarenales*, or *atrabilariæ*, *renes inccenturiati*) are two small bodies, a right and a left, placed above the upper extremities of the kidneys, which they cover to a certain extent, and behind the peritoneum. They are sometimes double on one or both sides. Their size varies much according to the age of the subject: in the first months of foetal existence they are at least as large as the kidneys, and they continue to grow until the first years after birth: but as this growth is much less rapid than that of the kidney, the proportionate sizes of the two organs are soon entirely changed, and become such as we find them in the adult. When they have acquired their greatest magnitude, they sometimes preserve it in the adult; or they are gradually

gradually diminished, and at last disappear almost entirely. Their figure does not much resemble any known object; it is somewhat triangular, and bent from above downwards. We may distinguish in them an anterior and a posterior surface, a superior and an inferior margin, an internal and an external extremity.

The anterior, which is also the broadest surface, presents, a little above its middle, a transverse groove, which receives the chief capsular vein: this corresponds, on the right side, to the inferior vena cava and the duodenum; on the left, to the spleen and pancreas. The posterior surface is in contact with the semi-lunar ganglion and the diaphragm. The inferior edge, which from its breadth has been described as a surface, is excavated obliquely from before backwards, and from above downwards, and embraces the superior end of the kidney. The superior margin, thin and convex, is rather inclined inwards, corresponding to the liver on the right, and to the spleen on the left side. In the extremities there is nothing remarkable: the inner is rounded and rather lower than the outer, which is more pointed. The whole exterior is unequal, with an appearance of small lobes, and adheres to the neighbouring parts by numerous vessels, by nerves and by a loose adipous substance, continuous with that which surrounds the kidneys. This substance in most cases nearly resembles the capsules themselves in colour, so that they may be easily overlooked in a superficial examination.

A kind of triangular cavity occupies the middle of the capsule, with an oblong eminence, caused by the course of a vein projecting into it below: the sides of this hollow often appear united by a kind of downy matter. It contains a fluid of a reddish colour in the fœtus, yellow in young subjects, and brown in the adult. Its consistence and quantity are variable; and it is coagulable by alcohol. It has been asserted that this cavity may be inflated by the capsular vein; but Haller could not succeed in attempting this in the human subject, although he accomplished it in animals. Some deny the existence of a cavity, and others have asserted that it is a vein. Haller saw it clearly sixteen times in the human subject: it was not observable in three instances.

The colour is a brownish-yellow, and deepest in the interior: it has more of red in the fœtus and in children. The form at that time is more rounded, the volume more considerable, and the fluid more abundant. Their consistence is moderately firm; more so on the outside than in the internal portion, in the adult than in the child. They are composed of lobes divisible into lobules, which may again be reduced into smaller portions. The surrounding cellular substance enters the organ and joins together these portions. In this respect the structure of the renal capsules resembles that of the conglomerate glands; but no excretory duct has been discovered in them.

Their arteries are numerous, and divided into superior, which come from the lower diaphragmatic, middle from the aorta or celiac artery, and inferior, which arise from the renal. They anastomose frequently, and seem to run on the surfaces without entering the substance of the organs. The veins are less complicated. There is always a large one on each side, produced from the inferior vena cava on the right, and from the renal vein on the left side. It enters the groove of the anterior surface, and after running through it, passes into the neighbouring adipous substance, and to the lower part of the diaphragm. The branches enter the substance of the capsules, but probably do not open into the cavities, as some have supposed.

Lymphatic vessels arise from all points of these organs, and several join those of the kidney. On the right side they go to some lymphatic glands placed round the vena

cava, below the liver; or they are united with the absorbents of the liver, and proceed with them to the thoracic duct. On the left side they enter glands placed in front of the left crus of the diaphragm.

The nerves of the renal capsules come from the celiac ganglia and from the renal plexuses.

Physiology of the renal Capsules.—The use of these bodies is entirely unknown: the physiologist or pathologist has not hitherto noticed one fact that can throw the smallest light on their office, or that can prove them to possess any connection with any function of the animal economy. "From an attentive consideration of all circumstances," says Haller (*Elem. Physiolog. lib. xxvi. sect. 4, § 14.*) "I can venture to affirm nothing further of these capsules, than that they secrete a fluid, which is more necessary to the life of the fœtus than to that of the adult. I can draw nothing from comparative anatomy, except the probable conjecture, that they are made for important purposes, as they are found in so many animals. They are large, and have a large cavity in the carnivorous, as the tiger, and in some herbivorous animals. But in other herbivora they are small, and the cavity is small in the voracious shark."

The urinary bladder, or muscular and membranous reservoir for the urine, is placed at the middle and anterior part of the pelvis, behind the bones of the pubes; before the rectum in man and the uterus in woman; below the small intestine, above the lower part of the rectum, the vasa deferentia and vesiculæ seminales in man, and the vagina in woman. This is the natural situation of the bladder in the adult, but age and various circumstances produce changes in this respect, which it is important to observe. In the fœtus the bladder is situated almost entirely out of the pelvis, and reaches nearly to the navel, in the midst of the cellular substance, which occupies the lower and front part of the abdomen, externally to the peritoneum. Hence it follows, that at this age its anterior surface is covered by the peritoneum only at the upper part, and that in the rest of its extent it corresponds immediately to the ossa pubis and the recti and transversi abdominis. It may accordingly be opened above the pubes, even in its empty state, without wounding the peritoneum. This peculiarity of position arises from the bladder being greatly developed in proportion to the neighbouring organs, and especially from its being very elongated, while the pelvis is small and very shallow: the upper aperture moreover is very oblique, and the rectum, distended by a large quantity of meconium, particularly towards the latter periods of pregnancy, almost entirely fills the pelvis. As the cavity of the latter is developed, the bladder sinks in it, and retires from the umbilicus. At three years of age it is said to rise hardly more than three fingers' breadth above the pubes, and at twelve this is reduced to about half an inch: at eighteen it is said to be completely hidden behind the bone. Haller, however, observes, that he has seen the length of this viscus remaining even to the time of puberty, so that it still projected considerably above the pelvis. In the adult, where the pelvis is deep, and the bladder shorter, not exceeding the bulk of an egg in its undistended state, it never rises above the pubes when empty; and even at other times is generally below the upper edge of the bone. But when it contains a large quantity of urine, it ascends and forms in the hypogastric region a very discernible tumour, which rises and increases gradually, in proportion as the quantity of contained fluid becomes greater. It may reach in these cases beyond the umbilicus. It is contained in the abdomen in the latter months of pregnancy. Perhaps it may be inclined rather more backwards in the supine position of the body. It has sometimes been contained

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contained in an inguinal or vaginal hernia. Its situation is not always perfectly straight, but sometimes, as Celsus has observed, rather inclined to the left. It is retained in its situation by cellular substance, which surrounds it on all sides, and by other means, which will be described presently.

The capacity of the organ differs according to the age, sex, and diseases. It is much greater, in proportion to the size of the body, in children than in adults: it diminishes afterwards as it sinks in the pelvis. It is larger in persons who have the habit of retaining the urine for a long time, than in others; and on this account it may be larger in some females. In cases of retention of urine it sometimes is so enlarged as to hold several pints: and it is diminished in a corresponding degree in other affections, as when it is irritated by the constant presence of a stone, or by any other cause. We can hardly assign any particular capacity as the natural one, there is so much variety in different individuals: a healthy person may void, at one time, from half a pint or less to two pints.

The figure of the bladder, in an adult male, is nearly that of an oval, rather flattened from before backwards, with the large extremity placed downwards and a little backwards, and the smaller in the contrary direction. In females, and particularly in those who have had many children, it is not so high, but broader in the transverse direction. It is very elongated, and nearly cylindrical, in the fœtus, at which time its extremity, formed by the urachus, approaches the navel: its length is three times its breadth, and its transverse diameter is nearly equal to the antero-posterior. At no long period after birth these dimensions change, the bladder becomes more rounded, and assumes a somewhat pyriform figure; and, as the child grows, the figure approaches more and more to the oval. Several anatomists distinguish in the bladder a superior portion, which they call the fundus; a middle part, or body of the bladder; and an inferior division, comprehending the lower surfaces and the neck. We shall divide the organ into two surfaces, an external and an internal.

The external surface may be naturally divided into six regions: *viz.* an anterior, a posterior, a superior, an inferior, and two lateral, or right and left.

The anterior, which is slightly inclined forwards, is bounded above by the urachus, and below by the neck of the bladder. At its lower part are seen two small fibrous fasciculi, called anterior ligaments of the bladder. They have a horizontal direction, and are attached to the back of the symphysis pubis in front, to the superior portion of the neck of the bladder, and to the prostate behind. This region then corresponds to the flattened posterior surface of the ossa pubis and their symphysis, to which it is connected by a loose cellular substance. When the organ is empty, or moderately filled, it does not ascend above the bone; but in the distended state it rises out of the pelvis, and corresponds immediately, without the interposition of the peritoneum, to the abdominal muscles. Hence, at this time it may be perforated by a trochar, or opened for the extraction of a stone, without exposing the patient to an effusion of urine in the abdominal cavity.

The posterior surface, slightly inclined upwards, is convex, smooth, entirely covered by peritoneum, contiguous to the rectum in the male, and to the uterus in the female subject, and to the inferior convolutions of the small intestine in both sexes.

The lateral regions, which are broader below than above, are covered by peritoneum in their posterior portion only: in front they are connected to the sides of the cavity of the

pelvis by a large quantity of cellular tissue. The umbilical arteries, and the vasa deferentia, pass along them.

The superior region is commonly called the fundus of the bladder; it corresponds to the convolutions of the small intestine, and affords attachment to the superior ligament of the bladder. The latter is composed of the urachus and of the two umbilical arteries, each of which is here included in a small saciform portion of peritoneum. The urachus, occupying the middle of this ligament, appears in the adult under the form of a whitish fibrous cord, extended from the fundus of the bladder, on the external surface of the peritoneum, to the umbilicus, where it is confounded with the aponeuroses of the transverse muscles. It is about as thick as a small quill at the bladder, but it grows gradually smaller towards the navel. It possesses no interior cavity, and seems capable of no other use than that of fixing the bladder in its situation. Instead of being solid and ligamentous, it is said sometimes to form a true canal, by means of which the urine escapes at the navel: this unusual appearance, which we have never seen, is said to arise from obstruction at the neck of the bladder, and to cease as soon as the urine flows through the urethra.

The elongated figure and great elevation of the bladder in the fœtus, make the urachus very short; it then forms a canal, beginning from the upper part of the bladder: thence it ascends to the umbilicus, becoming at the same time contracted. Lastly, it enters this ring with the umbilical arteries, and is continued into the cord: according to Haller, it may be filled with mercury for an inch, or an inch and a half. Farther on, it is said to be divided into several filaments, which are lost on the arteries: but Mr. Cruikshank states that it is continued, in the form of a very slender thread, throughout the cord. In quadrupeds it is manifestly hollow, and passes through the cord to a membranous bag called the allantoidis, in which it ends. Its diameter is variable: in general it is not more than one-third of a line in breadth, and it opens into the bladder by an orifice, which is so small and difficultly found, that many good anatomists have altogether denied its existence. Sometimes it is considerably larger in this situation. Haller says that he has expressed from it a drop of gelatinous lymph, and others speak of urine as contained in it. Its consistence is firm; it seems to be formed by a prolongation of the internal coat of the bladder, inclosed by long and hard fibres continued from the muscular coat. It is closed, and becomes solid and ligamentous some time before birth: its cavity is obliterated, like that of the umbilical vessels, and it can no longer be dilated, or receive urine. Sometimes, however, it remains open: Haller introduced a hog's bristle into it in the adult, and he mentions gravel being contained in it in another instance. In 1787, says Boyer, I dissected the bladder of a man thirty-six years old, whose urachus formed a canal an inch and a half long, and contained twelve urinary calculi of the size of millet seeds. I ascertained that the containing tube was not a sacculus or elongation of the internal coat through the muscular tunic. These examples of a hollow in the urachus of the adult are very rare.

As the existence of a canal in this part is sometimes denied, we subjoin the following express testimony of Haller on the subject. "Doubts have been entertained whether the urachus be hollow, since we often find that nothing passes into it, when the bladder is distended with air or mercury; and several good anatomists have found no canal. But the repeated investigations of this matter by myself, and by one of my pupils, have plainly shewn that a foramen leading into the urachus exists at the top of the bladder in the human fœtus. When the surrounding cellular substance

has been removed, and the fold, which is sometimes formed between it and the bladder, is destroyed, air, quicksilver, or a bristle will enter easily: I have also squeezed out a drop of gelatinous fluid, and others have found urine in the cavity. It may be demonstrated as far as the umbilicus." *Elem. Physiol. lib. xxv. sect. 2.*

The two umbilical arteries, which are constantly obliterated in the adult, form merely ligamentary cords of a cylindrical figure, placed at the sides of the urachus, and adhering like it with tolerable firmness to the peritoneum.

The falciform processes of the peritoneum are necessarily and mechanically produced by the reflexions of that membrane on the three ligamentary cords just described: they raise the membrane from the sides of the cavity, and make it project into the abdomen in the form of three small elongated folds, of which the middle furrounds the urachus, and the two lateral ones the umbilical arteries. They are broader below than above, and more strongly marked in the fœtus than in the adult. They are united and blended at the navel, but separate as they descend; the middle, which is vertical, and corresponds to the linea alba, terminating on the fundus of the bladder, the lateral ones, which diverge, on the sides of the organ.

The lower region, which is also called the basis of the bladder, is rather more extensive from side to side than from before backwards. It is subdivided into an anterior and a posterior portion: the former, rather more elevated than the latter, is narrow, shaped like a funnel, and called the neck of the bladder. It is embraced by the prostate, and corresponds to the posterior and inferior part of the symphysis pubis. The posterior part is large and expanded: it is bounded behind by the kind of cul-de-sac which the peritoneum forms as it is reflected from the back of the bladder to the rectum. This part covers, in man, the vesiculæ feminales and vasa deferentia, which are united to it by cellular tissue, close in front near the prostate, and looser behind: in the triangular interval, separating the vasa deferentia, the surface of the bladder is in contact with the rectum, and connected to it by a loose abundant cellular substance, containing fat and interspersed with numerous blood-vessels, particularly veins. In the female this part of the bladder corresponds to the front of the vagina. The sides of this lower portion of the bladder are covered in both sexes, by the levatores ani, and correspond to the intervals between the anus and the tuberosities of the ischia.

The internal surface is polished and covered by an abundant mucous secretion. It presents a great number of wrinkles, more or less strongly marked, taking various directions, and formed by the internal membrane. These are very apparent when the bladder is empty and contracted, but are effaced almost entirely when it is dilated. They arise from the unequal contraction of the muscular and mucous tunics, of which the latter possesses a much less degree of contractility than the former. In some subjects there are seen, besides these wrinkles, elongated prominences, resembling in many points the muscular columns of the right auricle of the heart. These are formed by the fibres of the muscular coat, disposed in large fasciculi, and elevating the mucous membrane so as to project towards the bladder. Corresponding depressions are left between these columns, which have given rise to a particular name in French (*vesties à colonnes*), distinguishing the bladders with this appearance. Besides these depressions, there are sometimes cells or pouches of various sizes and number opening into the cavity. Stones may be contained in such cells, and are then called encysted.

The anterior, posterior, and lateral regions of the internal

surface of the bladder, present nothing besides what we have just particularized. In the superior region there is a small pore in the fœtus, often scarcely visible, and constituting the commencement of the urachus, which we have already spoken of. The inferior region offers to our view, in succession from before backwards: 1st, the neck of the bladder; 2dly, the triangular space; 3dly, the insertion of the ureters; and, 4thly, the inferior surface or bottom of the bladder.

The neck of the bladder, or orifice of the urethra, is a tolerably large circular opening with thick sides, contracted a little to form the urethra properly so called. It occupies the most depending part of the bladder in the fœtus, because the bottom of the organ (*basfond* in French) is not developed at that time. In the adult, the neck of the bladder is rather higher than the inferior surface; so that there is a slight declivity from the former to the latter, directed from before backwards and from above downwards. The circular figure of the opening in the neck of the bladder is ordinarily interrupted by a fleshy tubercle, arising from its lower portion, and called by Lieutaud, who first described it, *luette vesicale*, or *uvula vesicæ*. Its size varies, inasmuch that it is often scarcely visible. It is subject to enlargement, particularly in old persons, and then it forms an oblong tumour, rounded at its upper margin, and, by its situation, rendering the expulsion of the urine difficult. However, we sometimes find it swollen in the dead body when the bladder has not been distended. It seems to be chiefly formed by the internal membrane of the bladder, and to be merely the termination of the anterior angle of the triangular space. It is described by Mr. Home, in a paper contained in the *Philosophical Transactions*, as a third lobe of the prostate gland. (See the description of that gland in the article *GENERATION*.) In the natural state, the neck of the bladder is closed, except during micturition; and is only opened for the evacuation of the urine. It is surrounded externally by the prostate gland. (See *GENERATION*.) The opening is larger in the female; where, if it depended on the prostate, we should not expect to find a *luette vesicale*: yet Lieutaud ascribes it equally to that sex.

The *trigonum vesicæ* (*trigone vesicale* in French) is a triangular portion, bounded by three openings, which mark its three angles. These apertures are distant from each other about an inch, or an inch and a half, and are, in front, the opening of the urethra already described, which forms the apex of the triangle; behind and laterally, the openings of the two ureters. The surface is a little inclined backwards, and just prominent enough to allow of the fact being observed. It is much less wrinkled than other parts of the bladder, and may also be distinguished by its colour, which is not the same in all subjects, but constantly different from that of the rest of the organ, and generally whiter. The anterior angle, or apex, which is confounded with the *luette vesicale*, is nearly three or four times its thickness; it grows thinner towards the basis. Its thickness and colour, and the strong adhesion of the internal membrane, lead us to suppose that its organization is peculiar. It preserves nearly the same extent in the contracted bladder, and is then more prominent. It is more extensive in the female than in the male bladder.

The openings of the ureters, occupying the two posterior angles of the triangular space, are narrow, elongated, and directed obliquely forwards and inwards. Their diameter is much smaller than that of the ureters, and they often appear to be covered by small folds of the internal membrane, which it is necessary to elevate with a probe in order to see them clearly. The introduction of the probe shews us the obliquity of the canals, and the extent of their course be-

tween

tween the two coats of the bladder, a point which we have already mentioned in speaking of the ureters.

The bottom of the bladder is a large hollow situated behind the triangular space, and below the level of the neck: it is, in fact, the most depending part of the organ.

The sides of the bladder become thicker in proportion as the organ contracts, and they are rendered thinner when it is dilated. They consist of a serous, a muscular, and a mucous coat.

The first of these invests only the posterior region, and a small portion of the lateral regions. In the fœtus it covers also a small part of the front and upper portion of the organ. Its external surface is perfectly smooth, and moistened by a serous secretion. The internal surface is connected to the muscular covering, by cellular substance, in such a way as to admit with tolerable facility of separation by dissection. This covering is furnished by the peritoneum, which passes from the front of the abdominal cavity, that is, from the recti muscles or the ossa pubis, to the fundus of the bladder, then descends over the posterior to the inferior surface of the organ. Here it quits the bladder, and passes to the front of the rectum in men, to the anterior surface of the uterus in women. As it goes from one to the other of these organs, it forms on the sides the two folds improperly called posterior ligaments of the bladder, and in the middle a cul-de-sac, which is the lowest portion of the peritoneal cavity in the male subject. This part may become distended with the fluid of ascites; and, as the cul-de-sac just mentioned extends to within two or three inches of the anus in many subjects, the paracentesis of the abdomen might be performed, in the male subject, from the rectum; indeed this has been actually done in one instance. The cul-de-sac formed in the female, by the reflexion of the peritoneum from the vagina to the rectum, would allow a similar operation, in that sex, from the posterior part of the lower surface of the vagina.

Where this serous covering does not exist, the bladder is covered by a layer of cellular tissue, the thickness and appearance of which are not every where uniform. At the anterior region, behind the pubes, and on the lateral regions, it is very loose and abundant, and usually contains more or less fat. At the inferior surface it is less copious, but still loose, and containing little or no fat; a considerable number of vessels, particularly veins, is seen here. It is dense and whitish about the vesiculae feminales and prostate.

The muscular coat surrounds the bladder at all points; corresponding, by its external surface, to the serous tunic, and to the cellular substance; by its internal surface, to the outside of the mucous coat. It is composed of a thin stratum of pale fibres, disposed in fasciculi of various sizes, crossing each other in all directions, so as to form a very close network, of which the interstices present every variety of size and figure. Ordinarily the mucous coat is completely covered by this muscular tunic; but sometimes there are small spaces without any muscular covering. Through such spaces the mucous membrane may be protruded, so as to form the cells already mentioned, communicating with the cavity of the bladder.

An attentive examination of the muscular fibres shews us, that some have a longitudinal, others a nearly circular direction; that several are oblique, and that the rest compose an inextricable network. The longitudinal fibres, forming the exterior stratum, are directed from the neck to the fundus of the bladder. The anterior ones arise from the prostate and its covering, and sometimes from the posterior and inferior part of the pubes, and the front ligaments of the bladder; in the female, from the point of union of the

bladder with the urethra; they ascend over the front of the organ to its upper part, and afford to the urachus the external covering already mentioned. The posterior fibres form more numerous and larger fasciculi than the anterior: they pass from the urachus, over the posterior and inferior surfaces, to the prostate in man, and to the junction of the bladder and vagina in woman. Both these portions send off fibres laterally, which cover the lateral regions, decussate with each other, and with those of the more deeply-seated strata. As all these fibres have their fixed points in the prostate and neck of the bladder, they will draw the other parts of the organ, which are all more or less moveable, to the neck, and consequently press the urine against the orifice of the urethra.

The oblique fibres are less distinct and more deeply-seated than the longitudinal; and are so blended with the others that it is almost impossible to observe any order in their distribution. Some have a transverse direction, and embrace the bladder almost in a circular manner: the more deeply-seated they are, the more they approach to this course; yet several longitudinal fasciculi may be seen in the interior of the organ. The contraction of these fibres diminishes the capacity of the organ in all its diameters, and tends to bring its sides in all directions towards their common centre. The urine, thus forced on all sides, will escape in the direction where there is the least resistance; that is, the neck of the bladder, against which it is moreover forced by the contraction of the longitudinal fibres.

From its office of expelling the urine, the muscular coat of the bladder is frequently described as a muscle, under the name of detractor urinæ. It will be readily understood, from the account which we have just given of its action, that the bladder is brought into a flattened state, and lies wholly just behind the pubes, when this covering has contracted. The fixed point of the organ is behind those bones; the prostate and neck cannot move, and all the other parts are drawn towards them. In this state the organ is flattened before and behind, and has a triangular outline; the fundus forms the apex, the inferior surface the basis, and the lateral regions the two sides of the triangle.

In a distended bladder, the muscular coat is thickest at the inferior surface and at the basis; in other situations it is often remarkably thinner. This difference arises from the circumstance, that the coats do not yield equally to distention in all directions; for, when we divide a contracted bladder, the thickness is nearly uniform throughout.

The description of the muscular fibres about the neck of the bladder is stated very differently by different writers. Some admit, and others deny the existence of a sphincter vesicæ, or circular muscle surrounding the opening, and closing it by its contraction. The fibres in this situation are pale, and mixed with several veins and cellular texture; they are certainly completely continuous on all sides with the rest of the muscular coat. It is observed by Haller, that a sphincter was assigned to the bladder, in the first instance, from the supposed necessity of such a structure to account for the functions, rather than from actual dissection; hence Vesalius places it in front of the prostate. Santorini could find no circular fibres surrounding the mouth of the urethra. Others reject altogether the notion of a sphincter; and Winslow refers the descriptions of such a part to fasciculi arising from the pubes. Haller gives the following description from his own dissections. In men there are transverse and even arched fibres above, intricately connected together, and lying on the neck of the bladder, on the prostate, and on the longitudinal fibres arising from the pubes. Others of an arched form, with the concavity towards the bladder, lie under

under these. In women he found fibres at the anterior part decussating at considerable angles, so as to form a kind of circle; in other instances they were more transverse. The inferior fibres are transverse, continuous with the circular stratum of the bladder, and covered by the prostate. The effect of the contraction of these fibres, however slender and obscure they may be, must be that of contracting the opening about which they are placed.

The modern French anatomists will not allow the fibrous substance about the neck of the bladder to be of a muscular nature. "When the neck of the bladder," says Boyer, "is attentively dissected, we find under the external cellular stratum, and between that and the mucous membrane, only a whitish, thick, firm, and fibrous substance, continuous with the muscular coat, the fibres of which very manifestly end in it. There is no sphincter, since we see no distinct muscle, and the fibres of the neck are moreover continued with those of the general muscular coat. But the structure, which we have just described, communicates to the neck of the bladder a resisting power, which, although not produced by the action of any particular muscle, is still superior to the contractile tendency of the bladder." *Traité complet. d'Anat.* t. 4. p. 490.

The muscular coat of the bladder is proportionally thicker in the fœtus and child, than in the adult. The irritability of the organ, and the force exerted in expelling its contents, seem to be greater in the early years of life.

The name of nervous coat has been given to a whitish stratum, placed between the muscular and mucous coats. The structure of this is completely cellular; it is looser towards the former, and more close towards the latter of the tunics. It is very extensible, and recovers itself after distention, forming, in conjunction with the mucous membrane, the folds which we have described in the inner surface of the organ. It contributes considerably to the solidity of the sides of the bladder.

The internal or mucous coat lines the whole interior. It is continuous on one side, with the linings of the ureters; and on the other, with that of the urethra. To its external surface adheres the cellular stratum just described. Internally it is perfectly smooth, having no visible villi, nor any other inequalities except the rugæ which arise from contraction of the muscular coat. Its surface is constantly covered by a mucous fluid, destined, in the opinion of physiologists, to protect it from the irritating qualities of the urine. This secretion must be perpetually removed by the urine and perpetually renewed. It is expelled in that fluid, and becomes sensible by chemical analysis. When any cause of irritation affects the bladder, as for example, when a calculus is contained in it, this mucus is voided in very large quantities, to the amount of some ounces at each time of making water: in such cases it often subsides and concretes into a tolerably firm jelly.

The sources of this secretion cannot be easily demonstrated; although, as Haller observes, the glands of the bladder are mentioned as familiarly as if they were visible on superficial inspection. Is the mucus poured out by the exhalants of the internal membrane, or secreted in a glandular apparatus? Sometimes, but rarely, says Haller, have I seen simple follicles on the external surface of the mucous coat, chiefly near the neck of the bladder; some round, like those of the cheeks, equal in size to millet seeds, and in clusters in the female, others smaller. At other times I saw no follicles, but mere pores." *Element. Physiol. lib. 26. sect. 2.*

The mucous membrane is thin and whitish, particularly towards the neck of the bladder; in other parts it has a somewhat red tint. We do not know much of its organiza-

tion or properties. It is continuous, through the urethra, with the epidermis, and seems to resemble that part in being occasionally detached in shreds, and renewed.

A whitish eminence is continued from the ureter on each side towards the mouth of the urethra, and sometimes seems connected to the verumontanum. It is a firm substance, connected to the mucous membrane, and it forms the trigonum vesicæ already described. According to Haller and Morgagni, these risings are not constant.

The arteries of the bladder are derived chiefly from the umbilical; some small ones come from other branches of the internal iliac. The epigastric sends twigs towards the fundus. They anastomose together, and form an elegant network between the muscular and mucous coats, extending also into the latter. The veins, following the divisions of the arteries, terminate on each side in the obturator and internal iliac veins. They ramify chiefly on the lateral and inferior regions of the organ, where they form, together with those of the rectum, a considerable plexus.

The lymphatics arise from all points of the internal surface, and generally follow the blood-vessels. They go through small glands in the course of the umbilical arteries, and end in the hypogastric plexus.

The nerves come from the sacral and from the great sympathetic.

The urethra of the male has been described in the article GENERATION; we must insert in this place an account of that canal in the female. It is about an inch or a little more in length, but much larger and more susceptible of dilatation than in man. Its shortness and large diameter enable it to transmit stones of a considerable size; consequently, the operation of lithotomy is much less frequently performed on females than on males; and the former suffer, on the whole, much less from calculous complaints. It has been enlarged by sponge tents sufficiently to admit the finger and thumb. Its direction is nearly horizontal from the neck of the bladder, at which it begins, under the pubes and clitoris to the pudenda; but it describes a very slight curve, of which the concavity is turned upwards, and the convexity downwards. It corresponds above to the corpus cavernosum of the clitoris, adhering to it by a loose cellular substance.

Below it is very closely connected to the vagina, particularly in front, and forms a longitudinal projection, which is sufficiently conspicuous on the front of the canal. The anterior extremity is situated rather lower than the posterior, and terminates by an opening, called the meatus urinarius, at the lower part of the triangular space included between the nymphæ, and just on the front edge of the entrance into the vagina. This aperture, which is sometimes as large as the urethra, which it terminates, sometimes smaller, is irregularly rounded, and has a thick prominent margin, exhibiting the excretory ducts of certain mucous glands situated in the neighbourhood. In pregnancy, particularly towards the latter months, the meatus urinarius is rather drawn inwards, and not to be discovered without difficulty.

The structure of the canal is analogous to that of the male urethra. Externally it is covered by a thick layer of cellular and vascular matter, the nature of which has not been clearly ascertained, bearing considerable resemblance on a section to the vascular texture round the male urethra. This is not confined by any proper covering, as in the male, but is connected by loose cellular substance to the surrounding parts. At the front, the urethra and vagina are nearly consolidated into one substance, and are covered by a common layer of convoluted veins, called the plexus retiformis. The internal surface of the urethra is lined by a thin mucous membrane, continuous at one end with that of the bladder,

and at the other with the lining of the pudenda. It is marked by five or six longitudinal lines, in the intervals of which mucous lacunæ open in rows. There may be from four to seven orifices in each of the grooves, leading to canals, which are continued obliquely into the spongy texture of the urethra, and capable of receiving bristles. On the tumid edge of the meatus urinarius two very large sinuses open, capable of admitting the end of a probe. The structure of these organs resembles entirely that of the lacunæ in the male urethra. The mucous fluid secreted by them defends the surface of the urethra from the irritation of the urine: it seems also to be poured out more particularly in coition, or under the influence of strong desires.

Besides the difference of length and size in the urethra of the two sexes, arising out of the additional function belonging to this canal in the male, of conveying the fecundating fluid into the vagina, the want of prostate in the female is another remarkable distinction. There is no foundation whatever for the opinion of De Graaf concerning the female prostate.

Functions of the Urinary Bladder.—The urine secreted, as we have already observed, incessantly by the kidneys, is transmitted, without interruption, through the ureters into the bladder, retained there for a certain length of time, and then expelled by an operation under the controul of the will. The bladder, in its empty state, occupies a very small space, is concealed entirely within the pelvis, and has its relations to the surrounding organs reduced within a small extent. Its contracted coats are thick, but all of them are not equally concerned in producing this state of the organ. The serous coat, and the cellular layer, have nothing to do with it; and the mucous membrane, incapable of a quick and considerable contraction, forms the numerous wrinkles of the internal surface, which may be seen both in living animals, and in the dead subject. The continued contraction of the muscular covering produces the state in which the empty bladder is found; and if its coats at this time are thicker than those of the stomach and intestines; it is because the muscular fibres are stronger and more abundant. At this time there is, properly speaking, no cavity of the bladder. The urine, deposited drop by drop, dilates the organ insensibly, and makes it contract new relations to the surrounding parts. Although this distention takes place in every direction, except towards the front, it is most sensible in the long diameter, or from below upwards. Its basis presses on the rectum in man, and the vagina in woman; but the natural limits which the connections of these parts offer, prevent it from extending much downwards. In the opposite direction there is no obstacle to prevent its enlargement: it rises freely above the pubes, the muscular coat is distended, the wrinkles of the mucous membrane are effaced, and the whole organ is consequently rendered thinner.

The peculiar conformation of the ureters, at their entrance into the bladder, accounts for the urine not returning along these canals to the kidney. When the bladder is distended with urine or air, the ureters are compressed between the mucous and muscular coats, in that portion which is included between these coverings: and the obstacle becomes more complete, in proportion as the distention of the bladder is increased. This mechanism does not depend on any vital properties: you may throw air or any fluid into the dead bladder, through the urethra, but not a drop will gain admission into the ureters; force the injection, and the bladder will burst. Hence, when the urethra is impervious during life, and the bladder is distended far beyond its usual dimensions, the ureters are continually adding to the collection, stretching the organ so as to produce most severe pains, and

ultimately causing rupture. If the muscular covering be dissected away, fluids escape immediately.

Thus, we have no difficulty in explaining why no urine passes in a retrograde course into the ureters; but the cause, which prevents it from entering the urethra, is not equally obvious. Although this be the natural course, the urinary fluid does not pass constantly through the urethra, as it does through the ureters: it is retained for a considerable time, both in man and in quadrupeds, and never escapes spontaneously, in either instance, in the healthy state. After a certain delay, a sense of inconvenience and pain produces a voluntary muscular exertion, by which it is expelled. As there is an uninterrupted flow of urine into the bladder, why does it not constantly escape? The voluntary act, by which we suddenly interrupt the stream in micturition, or resist an urgent desire to void the urine, is manifestly the contraction of the accelerator, which closes the bulb of the urethra, and consequently intercepts the communication between the bladder and the front of the canal. But we inquire the cause which acts perpetually, not only independently of the will, but when we are not attending, even when we are asleep, in preventing the urine from flowing guttatim through the urethra, as it arrives from the ureters. It is the more interesting to discover this cause, since there seems to be in the bladder a natural tendency to contraction, in virtue of its irritable powers. Hence, where a direct opening is made into its cavity, when the resisting power of the neck is destroyed by paralysis, or when an open catheter is left in the urethra, the urine escapes constantly as it is secreted, and no accumulation takes place in the bladder. The effect cannot be produced by a sphincter, obedient to the action of the will, because it takes place in an infant unconscious of the usages of society and the laws of decorum, and in an animal which has never been trained to cleanliness. Both expel the urine at intervals, and in obedience to a stimulus, which seems to be the natural motive of the act. Moreover, the evacuation is so far from being spontaneous, that it requires a considerable effort.

Physiologists have commonly referred the closing of the urethra to the sphincter vesicæ muscle, and have considered it analogous, in every respect, to the sphincter ani. But this is unsatisfactory, when the very existence of the part, as a muscle, is questioned. To the action of this, which he acknowledges to be inadequate to the effect, Haller joins the relative position of the bladder and urethra. He observes, that the inferior portion of the receptacle descends below the level of the urethra, and may consequently be dilated without the urine running off through that opening; and that a greater portion of the bladder is so placed when the organ is distended. Hence, he adds, the bladder may be distended, in some degree, in the dead subject, before its contents will escape by the urethra. The French anatomists seem to be of opinion that there is some peculiar contractile and resisting power in the neck of the bladder: this is termed in the *Anatomie Descriptive* of Bichat, "le ressort ou la resistance organique du col;" t. v. p. 157. Boyer speaks of the "habitual contraction of the fibres surrounding the neck of the bladder, and the elastic force of the neck and prostate." *Traité complet d'Anat.* t. iv. p. 493.

We do not pretend to explain clearly the exact mode in which this business is effected. We see no sphincter muscle adequate to the purpose, and the circumstance noticed by Haller will not at all account for the retention of the urine until the fundus of the bladder has ascended far into the abdomen. We must be contented to recognise the existence, without knowing the nature of a powerful contractile

property in the neck of the bladder, retaining the urine, in ordinary circumstances, until the sense of inconvenience induces us to make the requisite voluntary exertion for its evacuation, and, in paralysis of the muscular coat, and other states of disease, holding it until the bladder, enormously distended, sphacelates and bursts. The advantages of this arrangement, in enabling us to retain the urinary secretion, until it has accumulated in considerable quantity, and in securing us from the fœtor, excoriation, and other annoyances, which a constant involuntary flow of urine produces, are too obvious to need a more particular detail.

Does the retention of the urine in the bladder produce any alteration in its qualities? Physiologists generally believe that the water is partly absorbed. The urine voided at different times possesses, as we have already remarked, very different properties: if, after emptying the bladder, we make water again in a short time, it is almost colourless and inodorous; allow a long time to elapse, and it will be high coloured, acrid, and have a strong smell. The latter properties particularly characterize what is voided after a night's sleep. These circumstances are most easily explained by the agency of the lymphatics. The admixture of secretions from the surface of the bladder is another important source of modifications in the urine, particularly when the organ is irritated or diseased.

The increase in the quantity of urine accumulated in the bladder produces an unpleasant feeling, which soon amounts to pain, and ends, if the cause continues, in the most excruciating agonies. Many circumstances influence the length of time, during which the urine is retained, and the quantity that may be accumulated before the desire to expel it is felt. The qualities of the fluid, as being more or less irritating, and the quantity secreted in a given time, produce considerable differences: a much larger quantity can be retained, when introduced gradually, than when secreted very fast. Habit has considerable influence; and hence women, from the usages of society, can generally support a greater distention than men. The bladder itself, without any disease, varies in its retentive power in the same individual, according to his state of health: the effect of age is also very perceptible: the irritable bladder of the child empties itself very frequently; in advanced age the contrary is observed. But the effects of disease are more obvious and important; in paralysis, distention produces no feeling, and the natural stimulus to evacuation does not take place. When the organ is affected by any irritating cause, as the presence of a stone, it will hardly bear a few drops of fluid.

The evacuation of the bladder is the joint effect of two powers; viz. the action of the respiratory muscles, and that of the muscular coat of the organ. By the first we overcome the resistance of the neck of the bladder; and the operation is finished by the second. We begin, as in all similar efforts, by a deep inspiration; then, retaining this air in the chest, we exert also the abdominal muscles. The perpendicular position of the body subjects the bladder, in the most favourable way, to the downward pressure of the diaphragm: the business is accomplished more difficultly in the recumbent posture. The effort is always greater in proportion to the distention of the bladder: when the quantity of urine is small, the exertion may be slight; but inspiration in all cases precedes micturition. A few drops, or a very slender stream, come through the urethra first, proving that the orifice of the bladder is very completely closed in the healthy state. It then comes in a larger and larger current, and with increasing force; being propelled further in young than in old subjects. When it flows in a full stream, we remit the effort with which the operation began,

and continue respiration in the ordinary manner: the process is completed by the powers of the bladder, which force out its contents in a continuous stream. We may still increase the impetus by renewing the effort; or we may project a portion of the fluid more forcibly by the assistance of the accelerator urinæ muscle. Perhaps the contraction of the bladder is the most important circumstance in the operation; for, when that is paralyzed, we put the respiratory powers in action without effect. Distention of the organ very much weakens its expulsive power; so that, when we have retained the urine beyond the proper time, we exert the abdominal muscles and diaphragm very violently for a considerable time without effect.

Towards the end of micturition, the urine again flows guttatin, as at the beginning; and the last portions are thrown into the urethra with so feeble an effort, that they must be expelled from that tube by the accelerator urinæ.

KIDNEYS, *Inflammation of*. See NEPHRITIS.

KIDNEYS, *Calculus in*. See NEPHRALGIA.

KIDNEYS of Birds and Fishes. See *Anatomy of BIRDS*, and *FISH*.

KIDNEY-bean, in *Gardening*, a common name which is often applied to a particular sort of bean. See PHASEOLUS.

KIDNEY-bean Tree, the common name of a particular kind of tree. See GLYCINE.

KIDNEY-vetch, the common name of a peculiar sort of vetch. See ANTHYLLIS.

KIDONIA, or CIDONIA, in *Geography*, a province of Crete, or Candia, which has retained the name of the ancient city of the Cretans, produces oil, grain, cotton, flax, silk, honey, wax, some fruits, and a tolerably large quantity of cheese: its territory is in general extremely fertile. The nearest mountains which lie to the south, being more temperate and more cool than the territory of Canca, yield a great many fruits; but little wine, much oil, and some wheat and barley are produced in this province. See CANDIA.

KIDWELLY, or CIDWELLY, a market town and parish of Caermarthenshire, South Wales, is seated on the banks of the river Gwandraceth, over which is a bridge, connecting two portions of the town called the new and old town. In the year 1800, the parish contained 333 houses and 1388 inhabitants. Kidwelly has been for many ages a town of considerable traffic. "Its harbours were so well frequented as to render it the rival to Caermarthen; the fisheries of this port were considerable; its coal trade great, and it had besides a flourishing internal business in the clothing line. But the condition of the place has been for years on the decline. By virtue of its charter, the affairs of the town are regulated by a mayor, who is chosen annually. About the middle of the sixteenth century, Leland speaks of Caermarthen having increased in consequence of the decay of Kidwelly harbour, the entrance of which became suddenly intercepted by a dangerous sand-bank, driven up by the sea, that prevented vessels of large burden from sailing up the river as before. It is worthy of remark, that this bar of sand, after lying so long in the situation above-mentioned, as to almost ruin the Kidwelly port, separated, a few years back, of its own accord, in the middle, and now affords a sufficient depth of water for the vessels commonly employed in the trade of this part of the country to come up the river. The old town, in the time of Leland, was nearly desolated, but the walls surrounding it appears, from his words, to have been entire, for he tells us, this part was "pretily waulid," and that he saw "three gates ther." The old town is at present inconsiderable." The castle, at one extremity of it, stands proudly elevated on an artificial mount, on the side of the marshes. It is allowed to be the most perfect building

of the kind in Wales, and, according to Mr. Donovan, "is certainly a magnificent remain of ancient military architecture. There is an air of solemn majesty in its appearance, that bespeaks a noble origin." In the same author's "Descriptive Excursions," is a print of this castle, and a long note on the history of the building controverts the assertions of Camden, Buck, and Grose, who affirm that "Kidwelly castle was built soon after the conquest by Maurice de Londres, one of the Norman knights, who conquered Glamorganshire." Instead of this, Mr. Donovan says it was built in 1189, by Rhys, Prince of Wales. Since that time it has undergone various alterations and enlargements. The present remains are carefully preserved from "every species of wanton depredation." The ground plan is nearly quadrangular, with four round towers at the angles; and smaller towers in the walls. At the west end is the chief entrance, between two other round towers. Several of the apartments are nearly perfect. The prospects from the summit "are uncommonly fine."

Near the church, in the new town, was a priory, or cell of Black monks. Donovan's "Descriptive Excursions through South Wales," 2 vols. 8vo. 1805.

KIE, or KIERI, a town of Persia, in the province of Mekran; 100 miles N.N.E. of Kidge. N. lat. $27^{\circ} 40'$. E. long. $60^{\circ} 8'$.

KIEKERNES, a town of Prussia, in the province of Jamland, situated on an island in the Rufs; 19 miles N.W. of Tilsit.

KIEL, a town of Sweden, in the lapmark of Afele; 55 miles S.S.E. of Afele.

KIEL, a town of the duchy of Holstein, situated at the bottom of a bay or gulf in the Baltic, and forming a convenient harbour. It contains 800 houses, three churches, an university founded in the year 1650 by Christian Albert, duke of Holstein-Gottorp, and considerably enlarged by the late king. It contains 24 professors, and when Mr. Coxe visited it about 300 students. It has also a college established in 1768. The prosperity of this place very much depends upon an annual resort to it of the nobility and persons of wealth in Holstein and Sleswick, for the transfer and disposal of their monies; this pecuniary intercourse usually lasted eight days, at which time was held a considerable fair, which commenced by the ringing of a bell on Twelfth-day, and terminated in the same manner on the eve of the Purification. It was formerly one of the Hanse towns, and the staple for all goods exported from or imported to Denmark. The district of Kiel is that portion of the duchy of Holstein, which descended to the line of Holstein-Gottorp, and belonged to Peter III. as part of his hereditary dominions. In 1773, the empress of Russia ceded it to the king of Denmark, in exchange for the counties of Oldenburgh and Delmenhorst, which she gave to the prince bishop of Lubec. This exchange was favourable to Denmark, as it possessed the whole duchy of Holstein. For an account of the canal of Kiel, see CANAL.

KIEL, *Lake of*, a lake of Norway, in the province of Christanland; 16 miles N. of Christanland.

KIELEE', or KIALTZE, a town of Austrian Poland, in the palatinate of Sandomirz, the see of a bishop; 24 miles E. of Malzgoez.

KIELO, a town of Persia, in the province of Irak; 35 miles N.E. of Sultania.

KIEMI. See KEMI.

KIEN, a town on the E. coast of the island of Ceram, one of the Molucca islands.

KIENG-HIEVER, a town of Persia, in the province of Irak; 39 miles S.S.W. of Hamadan.

KIEN-NING, a city of China, of the first class, in the province of Fo-kien. To its district belong eight cities of the third class. It is situated on the river Minho, which renders it a place of considerable trade. At the time of the conquest of China by the Tartars, this city sustained two sieges, and refused to submit to the power of the conqueror; but some time after it was taken, and all the inhabitants were put to the sword. It was afterwards re-established by the Tartars, who destroyed it. N. lat. $27^{\circ} 5'$. E. long. $117^{\circ} 2'$.

KIEN-TCHANG, a city of China, of the first class, in the province of Kiang-si, situated on the frontiers of the province of Fo-kien. It has five cities under its jurisdiction. In the adjacent country, which is fertile, the common rice is used in making wine, and a reddish fort is used by the richer people for food. N. lat. $27^{\circ} 35'$. E. long. $118^{\circ} 20'$.

KIEOU-CARPOU, a town of Corea; 500 miles E.N.E. of Peking.

KIEOU-KIANG, a town of China, of the first class, in the province of Kiang-si, situated on the S. side of the river Yang-tse-kiang, or Kian-ku; it has five cities under its jurisdiction. This city is the rendezvous of all the barks which pass and repass from the other cities of this province, and the provinces of Kiang-nan and Hou-quang. Although it is 300 miles distant from the sea, salmon, dolphins, and sturgeon are taken in its river; which ebbs and flows every new and full moon. N. lat. $29^{\circ} 53'$. E. long. $115^{\circ} 41'$.

KIERADY, a town of Hindoostan, in Benares; 15 miles E.S.E. of Chunar.

KIERALI, a town of Turkish Armenia, on the coast of the Black sea, at the mouth of a river of the same name; 30 miles S.W. of Trebifond.

KIERE, a town of Persia, in the province of Irak; 20 miles S.E. of Casbin.

KIERNOW, a town of Russian Lithuania; 25 miles N.W. of Wilna.

KIERTEMINDE, a sea-port town of Denmark, in the island of Funen, on the side of a large bay. The merchants of Odenfee have warehouses in this town; eight miles E.N.E. of Odenfee. N. lat. $55^{\circ} 22'$. E. long. $10^{\circ} 40'$.

KIESELSCHIEFER, in *Mineralogy*, a species of stone, which, according to Werner, comprehends the two following subspecies, viz. the *Siliceous schistus* of Kirwan, and the *basanite* of the same author. The principal colour of the former is ash-grey, blueish or greenish-grey, with occasional spots or stripes of red, and is often crossed by veins of quartz. It occurs in mafs, forming whole beds, or in smooth rounded pieces. Internally it is dull, rarely somewhat glimmering. Its fracture in the great is imperfectly flaty, and in the small intermediate between splintery and uneven, inclining sometimes to flat conchoidal. Its fragments are sharp-edged, indeterminate. It is opaque, occasionally somewhat translucent on the edges. It is hard, but not difficult to break, and is moderately heavy. Before the blow-pipe it becomes white and friable. It is found among transition mountains, in thick beds, in Bohemia, Saxony, Switzerland, the south of Scotland, and Siberia, &c. Wiedenmann supposes that this substance is argillite, containing a larger proportion than usual of filix. It is one of the numerous rock masses called by the Germans Hornschiefer. The second subspecies is the *basanite* of Kirwan, the Lydian stone, or touch-stone. Its colour is greyish, passing into blueish-black. It occurs in mafs and in rounded fragments, generally penetrated by veins of quartz. Internally it is glimmering. Its fracture is even, approaching to conchoidal, and sometimes to splintery: in mafs it is generally

nerally flaty. Its fragments are indeterminate and sharp-edged, often trapezoidal. It is opaque, moderately hard, and easily frangible. Sp. grav. 2.4 to 2.8. It is found in similar situations with the preceding. It is used, on account of its hardness and colour, as a touch-stone to ascertain the comparative purity of the various kinds of gold and silver alloys. (See TOUCH-STONE.) Humboldt ascribes its black colour to a portion of carbon. See SEMISTUS.

KIEV, KIEF, *Kiof*, or *Kioo*, in *Geography*, a government of Russia, bounded on the N. and N.E. by the government of Tchernigof, on the S.E. by the government of Ekaterinoslav, on the S.W. and N.W. by Poland; about 148 miles long and 60 broad; situated for the most part on the left side of the Dnieper. Being part of the Ukraine, or Little Russia, it was once a duchy belonging to the great dukes, and Kiev was their principal residence. This country was conquered by the Tartars, and came again into the possession of the great dukes; but was afterwards over-ran and possessed by the Cossacks, under the protection of Poland. In 1654, the natives, discontented with John Casimir, king of Poland, submitted to Russia, and have ever since continued subject to that empire. The vast privileges enjoyed by the natives have been gradually abolished, and they are now reduced to the same state as the other provinces of the Russian empire. The country is a continued plain, very fertile, and producing abundance of grain and pasture, honey, flax, tobacco, &c. Its capital is Kiev or Kiof.

KIEV, *Kief*, or *Kiof*, the capital of the above government, and of the district belonging to it, is situated on the *Dnieper*, which see. It consists of three small towns, *viz.* the castle of Petshersky, with its suburbs; the old city of Kiev; and the town of Podol, which lies below the latter. All these are partly inclosed by a common fortification, and communicate by a large entrenchment, carried on as the inequality of mountains would allow. The first mentioned castle stands on an eminence facing the south; and, besides barracks for the garrison, magazines, officers' houses, and some churches, includes a rich and stately monastery, founded in the eleventh century, and called "Petshersky," because the monks formerly lived in a "petshera," like a cavern, on the mountain where the convent now stands. In its subterranean vaults, which resemble a labyrinth, and consist of cells, chapels, &c. are found great numbers of undecayed bodies, supposed to be the remains of saints and martyrs. The old city of Kiev stands on an eminence facing the north, and is fortified, according to the mountainous nature of the country, with horn-works, &c. Here stands the cathedral. Podol lies below old Kiev, in the plain on the banks of the Dnieper, and besides the university, churches, and convents, entirely consists of shops and tradesmen's houses. This city is the see of a Greek archbishop; 420 miles E. of Cracow. N. lat. 50° 32'. E. long. 30° 56'.

KIEUSK, a town of Natolia; 40 miles N.N.W. of Mogla.

KIEZVENSKOE, a town of Russia, in the government of Perm; 80 miles N. of Perm.

KIFANTAN, a town of Bootan; 64 miles N. of Dinagepour.

KIFFER, an island in the East Indian sea, about 20 miles in circumference, near the north coast of the island of Timor. S. lat. 8° 0'. E. long. 126° 20'.

KIFTELAK, a town of Hungary; 18 miles N.W. of Zegedin.

KIGELGA, one of the *Fox-islands*, which see. N. lat. 54°. E. long. 194° 28'.

KIGGELARIA, in *Botany*, was named by Linnæus in honour of Francis Kiggel, a Dutchman, who imported many new and rare plants into Europe from America, and who published the *Hortus Beaumontianus* in 1690, and observations on *Commelin's Hortus Amstelodamensis* in 1697.—Linn. Gen. 528. Schreb. 697. Mart. Mill. Dict. v. 3. Ait. Hort. Kew. v. 3. 409. Juss. 387. Lamarck. Dict. v. 3. 365. Illustr. t. 821. Gært. t. 44.—Class and order, *Diœcia Decandria*. Nat. Ord. *Columnifera*, Linn. *Euphorbia*, Juss.

Gen. Ch. Male. Cal. Perianth of one leaf, concave, divided into five lanceolate, concave segments. Cor. Petals five, lanceolate, concave, a little longer than the calyx, and forming with it a sort of cup; nectary of five small, obtusely three-lobed, depressed, coloured glands, the middle lobe larger; each gland attached to the claw of a petal. Stam. Filaments ten, very small; anthers oblong, shorter than the calyx, opening at the tips by two perforations.—Female, Cal. and Cor. as in the male. Pist. Germen superior, roundish; styles five, simple; stigmas obtuse, slightly cloven. Peric. Capsule leathery, globose, rough, of one cell, and five valves. Seeds numerous, about eight, roundish, afterwards angulated, each covered with a tunic.

Eff. Ch. Male. Calyx five-cleft. Corolla of five petals; glands five, three-lobed. Anthers perforated at the tips. Female, Calyx and Corolla like the male. Styles five. Capsule of one cell, five valves, and many seeds.

1. *K. africana*. Linn. Sp. Pl. 1466. Hort. Cliff. 462. t. 29.—A native of the Cape of Good Hope. It flowers in May and June, and was cultivated, so early as 1690, in the Royal Garden at Hampton Court. This tree generally rises to the height of six or seven feet. Stems strong and woody. The bark of the branches is at first smooth and green, but afterwards purplish. Leaves on footstalks, alternate, lanceolate, serrated, spreading. On the male plant, panicles of flowers appear on branched stalks, with white petals and yellow nectaries; on the female, each flower stands on a simple stalk. Capsule rugged, and pubescent on the outside, containing a reddish or rusty-coloured pulp, in which the seeds are imbedded. The fruit has attained its full size in Chelsea Garden, but the seeds rarely come to maturity in this country.

KIGGELARIA, in *Gardening*, comprises a plant of the ever-green shrubby kind, which is the African kiggelaria, (*K. africana*.)

Method of Culture.—Plants of this sort may be increased by seeds, layers, and cuttings; but the seed method is the best, as they root but sparingly in the other two modes.

The seeds should be sown in the early autumn, in pots filled with fresh loamy earth, being plunged in a hot-bed. After they have a few inches growth, they should be removed into separate small pots, re-plunging them in the hot-bed; and when well rooted, they ought to be gradually hardened to the effects of the open air. The layers should be made from the young shoots of the same year, putting them down in the summer months.

The cuttings of the young shoots should be planted in the spring, immediately before the plants begin to shoot, in pots filled with soft loamy earth, being plunged in a very moderate hot-bed, and covered with glasses to exclude the air; due shade being afforded, and but little water given after the first planting. Such plants as strike root may be removed into separate small pots of loamy earth, and be exposed to the air, in a warm sheltered situation, until the autumn, when they should be placed under the protection of the green-house, and managed in the same mode as orange trees.

These

These plants afford variety among other plants of the green-house kind, that are in pots.

KIGLEY, or **KIGHLEY**, in *Geography*. See **KEIGHLEY**.

KIJASA, a mountain of Thibet; 25 miles S.E. of Giti.

KIKACCO, a town of Africa, in the kingdom of Congo; 30 miles S.E. of Pango.

KIKALA, a town of Sweden, in South Finland; 40 miles E.S.E. of Abo.

KIKIANY, one of the small Japanese islands. N. lat. 29° 40'. E. long. 132° 25'.

KIKOV, a town of Japan, in the island of Nippon; 15 miles S.E. of Iwata.

KIKUKOVI, a town of Russia, in the government of Tobolsk, on the Tschulim; 64 miles N.W. of Atchinsk.

KIKUTZ, a town of Japan, in the island of Ximo; 15 miles N.N.E. of Udo.

KIL, a town of Sweden, in the province of Warmeland; 12 miles S. of Chritinehamn.

KILAN, a province of the south-eastern part of Great Bucharia, deriving its name, like the other provinces of this country, from its chief city.

KILANG. See **KELANG**.

KILANOL, a town of Sweden, in West Bothnia; 105 miles N. of Tornea.

KILAR, a town of Persia, in the province of Irak; 14 miles S.E. of Taheran.

KILBARCHAN, a small town of Renfrewshire, about 4 miles N.W. from Paisley, and nearly the same distance from Renfrew. Kilbarchan is a thriving place, chiefly inhabited by the tradespeople employed in the various processes of the extensive cotton manufactures carried on through the whole of this district. There are also considerable manufactories of Scotch thread established here.

KILBEGGAN, a post-town of the county of Westmeath, Ireland, which, before the union, had the privilege of sending members to the house of commons. It is a small town, on the river Brosna, and is remarkable for two old monasteries. It is on the road from Dublin to Galway; 44 miles W. from Dublin, and 15 E. from Athlone.

KILBIRNIE, a village of Renfrewshire, near Beith, where there is a fine loch or lake of water. It is a populous, thriving, little place, engaged, like most others in that part of the country, in the manufactures of cotton goods and thread.

KILBRIDE, EAST, is a small village in Lanarkshire, about 10 miles S.E. from Glasgow. It is remarkable for some Roman antiquities, which have engaged the attention of antiquarians, who have published detailed accounts of various curiosities found and dug up in this neighbourhood. At present the great quantities of fine lime, which are worked in its neighbourhood, engage a considerably greater portion of attention, as it is found of great advantage to the whole surrounding district, both for the purposes of agriculture and building.

KILBRIDE, WEST, is a small village contiguous to the firth of Clyde, in Ayrshire.

KILBURG, a town of France, in the department of the Jarre, and chief place of a canton, in the district of Prum. The place contains 561, and the canton 4307 inhabitants, in 26 communes.

KILCH, in *Ichthyology*, a name used by some for a species of fish of the albula kind, caught in the lakes of Germany, of a fine firm flesh and delicate flavour, and seems very little, if at all, different from the ferra.

KILCOCK, in *Geography*, a post-town of the county of

Kildare, province of Leinster, Ireland, situated upon the river Blackwater. It is a small town, 14 miles W. by N. from Dublin, on the road to Mullingar.

KILCONNELL, a small post-town or village of the county of Galway, Ireland; 78 miles W. from Dublin, and almost 25 E. from Galway.

KILCULLEN, or **KILCULLEN-BRIDGE**, a post-town of the county of Kildare, province of Leinster, Ireland, situated on the river Liffey; over which it has a bridge. It is on the great southern road from Dublin, in consequence of which its inns are much frequented. One mile and half south of it is the village of Old Kilcullen, where is a church, and resident clergyman. Here is a round tower, not exceeding 50 feet in height; and the shaft of a cross, of a single stone, 10 feet high. Kilcullen-bridge is 21 miles S.W. from Dublin. Carlisle.

KILDA, **ST.**, or **HIRTA**, a remote island among the Hebrides, or western islands of Scotland. It is seated in the Northern ocean, at the distance of about 60 miles from Harris, and 160 miles from the nearest point of the main land of Scotland. This island is small, being only three miles in diameter from east to west, and two miles in a transverse direction: the whole circumference is about ten miles. It is nearly surrounded with a perpendicular face of rock, which rises to a considerable elevation; a small bay or landing-place is found to the south-east. Mr. Macaulay, the historian of this island, says, it "may be ranked among the greatest curiosities of the British empire. The situation of the place, the genius of the inhabitants, their manners and customs, the constitution of their little commonwealth, that amazing dexterity with which they manage the most important branches of their business, that unexampled courage with which they encounter dangers insurmountable to any other race of men, and that perhaps happy ignorance which renders them absolute strangers to those extravagant desires and endless pursuits which keep the great and active world in a constant agitation;—all these, and some other extraordinary circumstances, taken together at one view, seem highly to merit the attention of the inquisitive." The surface of the island is mostly rocky: in some places are patches of moss, and in others grass. The soil, though in many places well adapted to corn, is chiefly employed in pasture; as the inhabitants are rather averse to agricultural pursuits. In the vicinity of the village a little corn is cultivated, and the pasture is richly manured. Barley and oats are only sown: potatoes and cabbages, and some other garden plants, have recently been introduced into the island. Several springs issue from the hills, and form two small streams which run into the sea on the east and on the west. The village consists of two rows of houses, which are situated about a quarter of a mile from the bay, and contains all the inhabitants of Kilda. In the year 1764, when Macaulay published his History, the island contained only 88 persons; but he asserts that a contagious distemper (the small-pox) "swept away the greatest part of the people about four-and-thirty years ago." Martin found 180 persons, when he visited the island at the time here alluded to, *i. e.* 1690. The dwellings are all low, common huts, or cottages; divided into two rooms each, and peculiarly flat in the roof. One of the apartments is appropriated to the dwelling and sleeping of the inhabitants, and the other for the cattle during winter. In these rooms they prepare the chief manure for the lands. Besides these cottages, there are several cells or storehouses in different parts of the island. These are composed wholly of stones, and are from 12 to 18 feet in length, by 7 feet in breadth and height. Fowl, eggs, and sheep are the principal objects of care and solicitude to the

the Kildeans, who entirely support themselves, and pay their rents with these. The inhabitants manifest particular skill and courage in obtaining the first: for as their places of resort for rearing their young, for roosting, &c. are recesses in the lofty cliffs on the coast, it requires particular adroitness and courage to reach such spots. A fowling party consists of four men, who are provided with a strong rope made from thongs of raw cow-hide. One end of this is fastened on the top of the cliff, whilst two men descend by means of the rope to various cliffs in the rock, where they search for eggs and young birds. Among these, the soland goose or gannet is deemed the most valuable prize.

The laird of Macleod is proprietor of this island, and its dependants, rocks, &c. He sends his steward annually to collect the rents, which are paid in sheep, butter, cheese, and wild-fowl. Around the island are several small insulated rocks, which are often covered with wild-fowl. Fluors, spars, and rock crystals are found on the north side of the island. This insulated spot was certainly visited by religious persons at a remote period. Macaulay describes a circular arrangement of upright stones, which he calls a Druidical temple; with other remnants of pagan worship and monastic rites. See his *History of St. Kilda*, 8vo. 1764.

KILDARE, a county in the province of Leinster, Ireland, bounded on the north by Meath, on the east by Dublin and Wicklow, on the south by Carlow, and on the west by the King's county and Queen's county. It extends from north to south 32 Irish ($40\frac{1}{2}$ English) miles, and from east to west 21 Irish ($26\frac{1}{2}$ English) miles, forming an area of 242,245 plantation acres, or 369 square miles, equal to 389,198 English or statute acres. Of these, there are 41,035 acres of bog. The number of parishes is stated by Dr. Beaufort to be 113; of which, 57 parishes belong to the see of Dublin, and 56 to that of Kildare. From unions there are, however, only 39 benefices, and 23 churches. The number of houses stated in the return used by Dr. Beaufort is 11,205, from which the inhabitants are estimated at 56,000. This is a thin population for a county so near the capital, and not at all encumbered with mountains or high hills: but besides the great proportion of bog it contains, upwards of 3000 acres are occupied by the *Curragh*; and although this beautiful plain affords pasture to an immense number of sheep, there are but a very few habitations scattered around its edges. This county is mostly flat, of fine arable soil, but much exhausted, as, from its vicinity to Dublin, it has been for centuries the county from which the capital has principally drawn its supplies of grain. "In a county where one-fifth is bog," says Mr. Rawson in his Survey, "much water must lie on the surface: this, of course, attracts the rain from every passing cloud. It may be remarked in the summer season, that where a cloud passes over an extensive bog or river, it is arrested and drawn down. This causes the county to be subject to more moisture than any in Ireland; and this evil must continue until the kingdom be relieved by a general drainage act, which shall compel slothful occupiers and proprietors to come forward, and contribute to such extensive drainings, on a great public scale, as the legislature may in its wisdom direct, according to the benefit to be derived by each estate or property, through which such drains shall be pointed out." Since the preceding remarks were written, an act of parliament has been passed, and sums of money granted, for ascertaining the nature and extent of the various large tracts of bog in Ireland; and the reports of the engineers employed contain much valuable information. For this step, preparatory to a more effective measure, if the legislature shall be induced to proceed, the country is in-

debted, as for many other advantages, to the right honourable John Foster, late chancellor of the Irish exchequer;—a gentleman who, though now often loaded with reproaches from a spirit of party, will in future times be numbered amongst the greatest benefactors of Ireland. The county of Kildare is full of springs and rivulets. The river Barrow forms its south-west boundary, and receives the Grees. The Liffey takes a circular course through the north-east of the county, and the river Boyne rises in the bog of Allen. The Barrow is navigable from Athy, where it meets the Grand Canal, which, from Dublin, passes through this county, crossing the Liffey on an aqueduct bridge, and soon after branches off. Near Claine is a collateral cut to the Shannon. The Royal Canal also has been carried through the northern part of the county, so that great advantage is derived to the inhabitants from the cheap conveyance of their products to market. The principal towns are Naas, the assize town, Athy, Monasteraven, and Kildare; for account of which, see the articles under the respective names. As there is no borough of sufficient extent to return a member to parliament, the county is represented by the two knights of the shire only; whilst, before the union, it had ten members. Kildare was part of the territory acquired by earl Strongbow, in right of his wife, Eva, daughter of Dermot, king of Leinster. From its neighbourhood to Dublin it was early colonized, and formed part of the English pale, when confined to four counties. There are in it the ruins of many castles and abbeys, some of which are mentioned in other parts of this work. It was also the scene of much distress during the rebellion of 1798; many battles having been fought in it, and a vast number of houses destroyed, both by the rebels, and by the military force sent to subdue them. Beaufort's Memoir. Rawson's Statistical Account.

KILDARE, a post-town of the county of Kildare, Ireland. It is a small and ruinous place, but it retains some vestiges of having been of more importance in former times. There is a very fine round tower 130 feet high, and the ruins of two abbeys and of its cathedral. Except when there are races or encampments on the Curragh, which is very near it, it has no trade. It is 25 miles W.S.W. from Dublin.

KILDARE, a bishopric in the province of Dublin, founded about the end of the 5th century. It comprehends part of three counties, viz. Kildare, King's county, Queen's county, and contains 332,200 plantation acres, which are divided into 81 parishes. The crown is patron of 27, the bishop of 30, and different laymen of 24 parishes. In consequence of unions, however, there are but 31 benefices, and 28 churches. The bishop has no place of residence in his diocese, but being always dean of Christ-church, Dublin, resides in or near that capital. Beaufort.

KILDERKIN, a kind of liquid measure, which contains two firkins, or eighteen gallons, beer-measure, and sixteen ale-measure.

Two kilderkins make a barrel, and four an hogshead.

KILDORRERY, in *Geography*, a small post-town of the county of Cork, province of Munster, Ireland; 107 miles S.W. from Dublin.

KILDUIN, a small island in the North sea. N. lat. 69° . E. long. $34^{\circ} 14'$.

KILDYSART, a small post-town of the county of Clare, province of Munster, Ireland, on the river Shannon; 122 miles S.W. from Dublin.

KILEF, a town of Great Bucharia, in the country of Balk, on the left side of the Gihon; 60 miles N.W. of Balk. N. lat. $37^{\circ} 10'$. E. long. $64^{\circ} 30'$.

KILFIT, a sea-port town of Nubia, on the Red sea, with

with a harbour, seven miles in circumference, safe from winds. N. lat. $21^{\circ} 45'$. E. long. $36^{\circ} 40'$.

KILGRUND, a small island on the E. side of the gulf of Bothnia. N. lat. $62^{\circ} 5'$. E. long. $21^{\circ} 4'$.

KILIA, or KILIA-NOVA, a town of European Turkey, in the province of Bessarabia, at the mouth of the Danube, near the Black sea; 20 miles E.N.E. of Iffmail. N. lat. $45^{\circ} 28'$. E. long. $30^{\circ} 12'$.

KILIOS, a town of Asiatic Turkey, in Natolia, on the coast of the Black sea; 20 miles W.S.W. of Amasieh.

KILKARE, a town of Hindoostan, in Marawar; 10 miles S.W. of Ramanadporum.

KILKEALE, a post-town of Ireland, in the county of Down, and province of Ulster. It is situated on the Irish sea, under the Mourne mountains, great part of which are in the parish of Kilkeale. It is 65 miles N. by E. from Dublin.

KILKENNY, the name of a county of Ireland, in the province of Leinster. The surface of it extends from $52^{\circ} 14'$ to $52^{\circ} 52'$ N. lat. and from $6^{\circ} 56'$ to $7^{\circ} 37'$ W. long. from Greenwich. Its greatest length from N. to S. from the Slewmagy hills to the Suire is 36 Irish ($45\frac{1}{2}$ English) miles; and its greatest breadth from E. to W. is about 19 Irish (24 English) miles, but in the narrowest part is not above 12 miles. The area, according to Dr. Beaufort, is 300,350 Irish, equal to 482,464 English acres; but Mr. Tighe, in his valuable statistical survey, from which this article is chiefly extracted, says, that by a survey lately made for the use of the grand jury, they are stated at 318,249 Irish, which are equal to 510,882 English acres. The population, as calculated with great care from the hearth returns in 1800, is about 108,000 in 17,212 houses. Dr. Beaufort, however, in 1792, stated the houses as 17,569, though he did not make the inhabitants exceed 100,000; and he observes that the houses are much fewer than what might be expected in a county which has been generally esteemed one of the most populous in Ireland. The latter writer states the number of parishes to be 127, of which 121, united in 45 benefices, are in the diocese of Ossory, and the remaining six, forming four benefices, in that of Leighlin. The entire number of churches in the county is only 31, a very considerable proportion of the population being Roman Catholic. The position of a country strongly affects the climate. This is agreeably experienced in this county. The declivity from the northern to the southern boundary is about 500 feet, which conveys, with sufficient rapidity, the water that falls upon the surface; and the river Nore flowing through the centre, descends about 13 feet during the run of a mile. Besides this descent, which carries off the water, the surface of the county enjoys a favourable exposure to the south-east. There is little either of bog or marsh to contain stagnant water, and the greater part of the substratum is limestone, brittle schistus, or porous argillite, and only in a small part, a retentive clay. The vicinity of the ocean tends to render the climate mild, while the clouds, which are driven forward by the western and south-western winds, are not arrested here by high mountains, but passing over the low secondary hills and extended plains of this county, are attracted towards the lofty and primary ranges of rocks which rise on the north-east. From these circumstances the crops are earlier in general than in the tillage countries to the northward. The quality of the soil is in general excellent. The northern part rather bears the appearance of poverty, but by judicious management, and the prudent application of lime and limestone gravel, it may be rendered considerably productive in corn and grafs. The

southern part is more favoured by nature; and where the hills subside into plains or vallies, fertility smiles in all its native excellence. The Nore exhibits upon its banks the most delightful prospects and the most luxuriant fields. It is not difficult to trace the nature of the different minerals in this county. Here is a termination of a chain of granite hills which take their rise in Wicklow. The stone which usually joins the granite, appearing to be imposed on it, is siliceous schistus, and lower down occurs argillaceous slate; on the surface of the lower grounds are found large boulders of quartz, sometimes pure white, sometimes streaked with red, and sometimes enclosing yellow mica. In this granite district are also found a few beds of marl and limestone gravel near the foot of Brandon hill. Many of the lower hills consist of siliceous breccia, which is composed of a silicious cement enveloping rounded pebbles of quartz, which have often a reddish tinge, and are from the size of a pea to two or three inches diameter. Such a breccia also forms many hills in the S. of Ireland, as the Galtees and other mountains in Cork and Limerick, and at least part of Magillicuddy's rocks in Kerry. This breccia, when of a fine grain, is worked for millstones. In the northern part of the county are excellent quarries for flags, especially that of Shankill. The flags raised here are sent to Dublin, Cork, and other places, where they chiefly go under the denomination of Carlow flags, being raised in the neighbourhood of that county, and mostly sent through the town of Carlow. The collieries of Castlecomer have been worked for about a century, and are yet unexhausted. The coal found in them, and in other parts of the S. of Ireland, is un-inflammable, and is called Stone coal and Kilkenny coal, and when of inferior quality, *culm*. By Mr. Kirwan's analysis it contains 97.3 *per cent.* of pure carbon. Mr. Tighe has given a very full account of the accompanying strata, the manner of working, the expence, &c. The late lord Wandesford used to clear 6000*l.* or 7000*l.* a-year by these collieries, and sometimes more. They now belong to lady Ormonde. The excellent qualities of the Kilkenny coal are well known in Ireland; on this account it is sent to the north and the south, to Londonderry, to Belfast, to Cork, and to Waterford, as well as to Dublin. No fuel dries malt so well, and this without any preparation; it is excellent for the forge, and for most works in iron; in every manufacture where steady heat is required devoid of smoke it cannot be excelled; nor does it dirty the flues where it is used. Manganese, iron ore, lead ore, and some indications of copper ore, are perceived in different parts. As long as timber lasted near Castlecomer, iron ore was smelted there; but it is now above seventy years since the forges have been used. In the limestone district of this county are many valuable marble quarries. The marble is black, though often with white marks, which appear more strongly, or increase by long exposure to the air. That which approaches nearest to black is most valued. It contains a great variety of impressions, of madrepores, of bivalve, and of turbinate shells. By analysis, a specimen of the kind most usual in chimney-pieces with marks of bivalve shells, contained 98 *per cent.* soluble in marine acid, and left 2 *per cent.* of a black powder, which appeared to be carbon, and burned without leaving any ashes. On the whole, Kilkenny marble may be considered as containing 97 *per cent.* pure carbonate of lime, two *per cent.* carbon, and 1 *per cent.* magnesia and iron, of which the former is in the largest proportion. This marble is a valuable article of commerce. The quantity exported, notwithstanding the disadvantage of land carriage, is about 50 tons annually; if a canal were made it would considerably

ably increase the demand, by lowering the price. There is a mill near Kilkenny, by which the marble is sawed and polished, which makes the price of chimney-pieces on the spot very reasonable. There is a chalybeate spa at Ballyspellin, near Johnstown, the medical effects of which have been often celebrated, and which is much frequented. The rivers of this county excel both in utility and beauty. The following poetical account of them by the immortal Spenser presents an accurate, concise, and clear account of the origin, termination, and qualities of the three principal ones.

“ And there the three renowned brethren were,
Which that great giant Blomius begot
Of the fair nymph Rheüsa wand’ring there,
One day as she to shun the season hot,
Under Slewblome in shady grove was got,
This giant found her, and by force deflowered;
Whereof conceiving she in time forth brought
These three fair sons, which being thenceforth poured
In three great rivers ran, and many countries scoured.

The first the gentle Shure, that making way
By sweet Clonmell, adorns rich Waterford;
The next the stubborn Newre, whose waters grey
By fair Kilkenny and Rosse-ponce board;
The third, the goodly Barrow, which doth hoard
Great heaps of salmon in his deep bosom:
All which long sundred, do at last accord
To join in one, ere to the sea they come,
So flowing all from one, all one at last become.”

The Suir, which divides Kilkenny from Waterford, in a winding and majestic course of about 16 miles, conveys along the southern border of this county, the trade that passes between Waterford, Carrick, and Clonmell. The Barrow skirts the eastern borders for about 20 miles, dividing it from Wexford and part of Carlow. This river is navigable to the town of Carlow, and thence communicates with the grand canal. The Newre, or Nore, more peculiarly belongs to this county, flowing nearly through its central part, in a winding course of not less than 36 miles from the neighbourhood of Durrow to its junction with the Barrow, passing by the city of Kilkenny. This last river receives many tributary streams, and is navigable for small vessels to Inistioge. It is unnecessary to enter into a minute detail of the obvious advantages of these rivers, both to the external appearance of the country and to the accommodation of the inhabitants. The natural and local advantages of this county tend to promote the interests of agriculture, which flourish in great perfection in different places, and the easy conveyance by water affords a ready market for all the productions of the soil. The roads in general are in good repair, and their situation judiciously chosen.

The county town is Kilkenny; besides, Callan, Inistioge, Thomastown, Gowran, Knocktopher, Graigne Durrow, Castlecomer, and Freshford, are entitled to the name of towns, though all of them are small ones. There are five round towers in this county, namely, at St. Canice, Tulloherin, Kilree, Fartagl, and Aghaviller. The last is the most ruinous. These are all situated close to the churches, and whatever may have been their origin, appear admirably fitted for belfries. Gramig, or Grandison castle, is one of the most considerable remains of antiquity; it is situated on the banks of the river Suir. The whole county is full of castles, having been one of the first in which the English settled. It became part of the property of earl Strongbow, from whom it descended to the Mareschals, earls of

Pembroke. Isabella, one of the daughters and coheiresses of William, the last earl, conveyed it to Gilbert Clare, earl of Gloucester and Hereford. The greater part of it afterwards came into possession of the Butlers, earls and dukes of Ormond. The houses of some of the absentees bear evident marks of decay; these, however, are outweighed by the modern structures, many of which are ornamented by the taste of the proprietors. Tighe’s Kilkenny; Beaufort’s Memoirs; Robertson’s Traveller’s Guide.

KILKENNY, a city of Ireland, in the county of the same name, and province of Leinster, which, with the borough of St. Canice, forms one large town, surrounded by a district, called the county of the city of Kilkenny; it is delightfully situated on the river Nore, over which are two handsome bridges; it contains 2870 houses, and a population of nearly 16,000. There are many large and good buildings, among which, the most remarkable are the bishop’s palace, the magnificent castle of the earl of Ormond, and the celebrated free school or college, where many learned men, among whom Swift, Berkeley, and Congreve are conspicuous, were educated. The inhabitants of Kilkenny have been long noted for the politeness of their manners. In this city and its environs abundance of blankets and much coarse woollen cloth are manufactured. Kilkenny was formerly represented by four members, two for the city, and two for the borough of St. Canice. At present it has only one representative. In former times parliaments were often held here, and the famous constitutions of Kilkenny, made when Lionel, duke of Clarence, was chief governor, in the reign of Edward III., long continued to be regarded as of the utmost importance to the welfare of the English colony. Kilkenny was also the seat of the Catholic council during the civil war, that succeeded the insurrection of 1641. There are but two churches in the city, but there are several Roman Catholic chapels, each of which has congregations more numerous than both the churches. Kilkenny is $57\frac{1}{2}$ miles S.W. from Dublin. N. lat. $52^{\circ} 38'$. W. long. $7^{\circ} 15'$. Beaufort. Tighe.

KILKENNY, a town of America, in Grafton county, New Hampshire, incorporated in 1774, and containing 18 inhabitants.

KILKENNY Coal. See COAL, and KILKENNY, *supra*.

KILKENNY Marble, a fine black marble full of shells, and coralloid bodies, and much used in chimney-pieces, &c. See Coralloid MARBLE, and KILKENNY.

KILKERRAN BAY, in *Geography*, a harbour of Ireland, in the county of Galway, in that part of it called Connemara; in it there is good anchorage for vessels of any burden, but the wild state of the country prevents its being of much use. Its entrance is in N. lat. $53^{\circ} 15'$. W. long. $9^{\circ} 50'$. Beaufort. M’Kenzie.

KILKILA, a town of Persian Armenia; 26 miles N.W. of Kanja.

KILL, an Irish word signifying a church or cemetery, which is used as a prefix to the names of many places in Ireland. There are two or three villages of this name, one on the great southern road, about 12 miles from Dublin.

KILLACK, in *Geography*, a town of Persia, in the province of Mekran, on the coast of the Arabian sea; 60 miles W. of Tiz. N. lat. $25^{\circ} 27'$. E. long. $59^{\circ} 20'$.

KILLALI, a town of Abyssinia; 100 miles S. of Miné.

KILLALLA, a sea-port and post-town of the county of Mayo, province of Connaught, Ireland. It is situated on the western coast of a bay of that name, opening into the Atlantic ocean, and is the see of a bishop. There are some

some coarse linen and woollen cloths made in it, but fishing is the chief occupation of the inhabitants. The French landed at this place on the 22d of August, 1798, and took possession of it. A very interesting narrative of their proceedings, till their departure, was published by Dr. Stock, at that time bishop, who was a prisoner. Killalla is 127 miles N.W. from Dublin, and 24 nearly N. from Castebar.

KILLALLA, a bishopric in Ireland, founded in the fifth century, which is united with Achonry, and is in the ecclesiastical province of Tuam. The united sees extend into the counties of Mayo and Sligo, the river May and the Ox mountains forming the boundary between them. They measure E. and W. 55 miles, and from N. to S. 21 miles. Large as this district is, there are only 20 benefices, each of which has a church, though only eight have glebe houses. The cathedral is small, but venerable for its antiquity; it is the only church in the parish, though a round tower at the other end of the town indicates the ancient site of another church, of which no vestige now remains. Beaufort.

KILLALOE, a bishopric in Ireland, in the ecclesiastical province of Cashel. It was founded early in the fifth century, and in 1752 was united with Killfenora, which, though small in extent and value, had continued separate till after the revolution, and was then annexed for several years to the sees of Tuam and Clonfert successively. The united sees comprehend most of the county of Clare, and part of Tipperary, with small portions of the King's and Queen's counties, Galway, and Limerick. The 138 parishes, united and condensed into 50 benefices, have only 38 churches and four glebe houses. The church of Killaloe is not large for a cathedral, but venerable for its antiquity, and in good preservation, though built above 660 years. Beaufort.

KILLALOE, a small post-town of Ireland, in the county of Clare, and province of Munster, Ireland. It is situated on the Shannon, over which it has a bridge of 19 arches. Below the bridge is a ledge of rocks which prevents the navigation of the river: here is a considerable salmon and eel fishery; but there is nothing beautiful in the town except the situation: very near the town, in the midst of a fine demesne, on the western bank of the Shannon, the bishop has a handsome residence, lately erected. Killaloe is 86½ miles S.W. by W. from Dublin, and 25 miles from Ennis.

KILLANORE, a town of Hindoostan, in the Carnatic; 9 miles N.W. of Trichinopoly.

KILLANY BAY, a bay on the E. coast of the island of Arranmore. N. lat. 53° 5'. W. long. 9° 36'.

KILLARD POINT, a cape of Ireland, in the county of Down, at the S. of the entrance to Strangford Lough, and six miles E. from Downpatrick. N. lat. 54° 22'. W. long. 5° 27'.

KILLARNEY, a market and post-town of Ireland, in the county of Kerry, and province of Munster. It is a neat and populous town, much frequented by strangers on account of the adjoining lake, the picturesque beauties of which charm every beholder. Lough Lane, or as it is more frequently called, the lake of Killarney, consists of two lakes, joined by a long narrow channel; in the lower and larger lake, the pleasing and the sublime are most happily combined; the upper lake reflects a more solemn grandeur from the stupendous crags, with which it is encircled; but the prospects in both are infinitely diversified. The several islands, the white rocks of Mucruss, the groves of arbutus, the venerable woods, the variety of waterfalls, and the impending cliffs, are separately as delightful and in-

teresting as their assemblage is infinitely grand and magnificent. Mr. Weld has published an interesting 4to. volume descriptive of the various objects that deserve the notice of the traveller, but as these cannot well be abridged, we must pass them over in this work. In the peninsula of Mucruss, cobalt and other minerals have been found, but they are not worked. In Ross island, in the lower lake, is a valuable mine, containing copper and lead; of the former there is not only rich sulphuret, particularly the kind called *purple ore*, but also grey ore, which brings a high price. Killarney is the residence of the Roman Catholic bishop of Kerry, and the population is chiefly of that religion. It is 144 miles S.W. from Dublin, and 38 W. from Cork. Beaufort.

KILLAS, in *Natural History*, a name given by the people, who dig in the mines of Cornwall, to a kind of greyish-white earth, which is of great hardness, and seems to approach very much to the nature of the *ludus Helmontii* of some kinds, only that it is somewhat less hard than that, and has nothing of the septa or partitions that make the character of that fossil. This earth contains so great a quantity of spar, that it ferments with acids very strongly, though that spar being once dissolved, and the earthy part of the substance only left, it will no longer ferment with these menstruums; whence it is evident, that its terrestrial matter is not alkaline, though the spar it contains is so.

This is the certain character of what is called killas in many parts of Cornwall, where it lies in strata of two, three, or more feet thick, and often beside this is laid on each side of the vein of tin or other ore. Its texture is either lamellar or coarsely granular; the lamellar is softer and less martial than the roof schistus: its specific gravity from 2.63. to 2.666. Kirwan found 100 grains of the lamellar sort to contain about 60 of silice, 25 of argil, 9 of magnesia, and 6 of iron; the greenish sort contains more iron, and gives a greenish colour to the nitrous acid. In some other parts of England, the miners use the same word to express a kind of white, brittle, and shattery stone, somewhat like the flag-stone with which they cover houses in Northamptonshire, and many other counties.

KILLAS is also used as the name of a slaty stone of various colours, spangled all over with talc in small flakes in the place where they use it. In this sense they generally express themselves, when talking of the earth described above, by the phrase *white killas*. They also sometimes call this slaty stone by the name *delvin*.

KILLEAM, in *Geography*, a parochial village in Stirlingshire, situated on the water of Enrick, near its junction with Loch Lomond. Killeam is the birth-place of the celebrated historian and poet George Buchanan, whose history of Scotland, and Latin paraphrase of the Psalms of David, are so universally known. A handsome pillar near Killeam was lately erected as a monument to his memory. An extensive printfield is the only manufacturing establishment in this neighbourhood. The pure soft water of the Enrick is indeed extremely well fitted for all the operations of bleaching, dyeing, and printing, but the want of coal is an almost insuperable objection in point of economy to such works. The nearest are nearly twelve miles distant. In the neighbourhood is Buchanan house, the family mansion of the duke of Montrose.

KILLENAULE, a post-town of Ireland, in the county of Tipperary, and province of Munster. The country around it is very fine. In the neighbourhood coal is found, of the same kind as that in the county of Kilkenny. It is 72½ miles S.W. from Dublin.

KILLERIES' HARBOUR, a bay of the Atlantic, on the

the west coast of Ireland, between the counties of Mayo and Galway. A vast number of herring busses rendezvous here in the fishing season, from all parts of Galway and Mayo. N. lat. $53^{\circ} 38'$. W. long. $9^{\circ} 46'$.

KILLESANDRA, or KILLESANDRA, a post-town of Ireland, in the county of Cavan, and province of Ulster. It is 61 miles N.W. from Dublin, and 8 miles S.W. from Cavan.

KILLFENORA, a village of the county of Clare, Ireland, which is the seat of a bishopric, united to Killaloe. It is four miles N.N.E. from Enniltymond, which is its post-town.

KILLICRANKY, a village of Perthshire, in Scotland, near which is a famous road, cut in the side of a mountain, called "Killicranky Pass;" on one side is a lofty mountain, and on the other a precipice of 100 yards; 12 miles N. of Dunkeld.

KILLIGRAY, a small island of Scotland, between Lewis and North Uist. N. lat. $57^{\circ} 43'$. W. long. $7^{\circ} 3'$.

KILLINCHY, a post-town of Ireland, situated on Strangford Lough, in the county of Down. It is 92 miles N. by E. from Dublin.

KILLINNESS POINT, a cape of Scotland, on the coast of the county of Wigton, in Luce bay; 3 miles N. from the Mull of Galloway.

KILLING. See HOMICIDE and MURDER.

KILLINGIA, in *Botany*. See KYLLINGIA.

KILLINGLY, in *Geography*, a town of America, in Windham county, Connecticut, situated in the north-eastern part of the state, bordering on Rhode island, and separated from Pomfret by Quinebaug river; about 18 miles E. of Windham: is incorporated in 1708, and containing 2279 inhabitants.

KILLINGTON, now SHERRURNE, a mountainous township of America, in Rutland county, Vermont, having on the W. Medway, N.E. Barnard, S.E. Saltsb., and containing 32 inhabitants. Killington peak is the highest land in Vermont, 3454 feet above the level of the ocean.

KILLINGTRINGAN BAY, a bay of Scotland, on the W. coast of the county of Wigton. N. lat. $54^{\circ} 58'$. W. long. $5^{\circ} 12'$.

KILLINGWORTH, a post-town of America, in Middlesex county, Connecticut, situated on Long island Sound; 9 miles E. of Guilford, from which it is separated by a stream called Hammonasset, the Indian name of the township. It was settled in 1663, incorporated in 1703, and contains 2049 inhabitants.

KILLISTINOES, Indians who originally inhabited a territory N. of Lake Superior, and could furnish 250 warriors. They extend to the lake of the Hills, and N. to the Eskimos. According to Mr. Mackenzie, they were originally the same people with the Algonkins, or inhabitants of the Atlantic coast. Their manners are described by Mackenzie. See our article KNISTENEUX.

KILLMACDUGH, a village of the county of Galway, which is an old episcopal see, united to Clonsfert. It is $2\frac{1}{2}$ miles from Gort, where is the parish church. Nothing but the walls of the cathedral remain, near which are the ruins of a monastery, and of several chapels. These, with a large round tower, of very ancient and rude masonry, denote the former consequence of this wretched village. It is 12 miles N. from Ennis.

KILLMATHOMAS, a fair and post-town of the county of Waterford, on the road from Cappoquin and Dungarvan to Waterford. It is 83 miles S.S.W. from Dublin.

KILLMALLOCK, a post-town of Ireland, which

formerly sent members to parliament. Two centuries ago, it was one of the best built inland towns in Ireland; the walls of many large houses of stone, and excellent workmanship, remain to this day, whilst the ruins of the churches and monasteries, walls and gates, denote its former splendour, and have procured for it the name of the Balbec of Ireland. It is often mentioned in the military history of Ireland, and there is an extensive district round it called the "Liberty of Killmallock." It is now, however, little more than a village; 4 miles from Charleville, 16 S. from Limerick, and $107\frac{1}{2}$ S.W. from Dublin. Beaufort, &c.

KILLMICHAEL POINT, a cape of Ireland, on the W. coast of the county of Wexford, in the Irish sea. N. lat. $52^{\circ} 44'$. W. long. $6^{\circ} 9'$.

KILLMORE, a village which gives name to a bishopric in Ireland, in the province of Armagh. The bishopric was founded in the 13th century, and in the 15th, changed its ancient name of Brefsny, into Killmore. There is no cathedral, but a small parish church, $3\frac{1}{4}$ miles from Cavan. It is situated in four counties, but chiefly in Cavan and Leitrim. There are 39 parishes in 30 benefices, and 36 churches.

KILLOS, a name given by the miners of Cornwall to a stone of the slate kind, found in the mines there. See GROWAN.

KILLOUGH, in *Geography*, a village of the county of Down, Ireland, on a bay to which it gives name, on the Irish sea. Here is a remarkable well, called St. Scordin's well, which is highly esteemed for the extraordinary brightness of its water. It is 7 miles S.E. from Clough.

KILLOW, or CULLOW, an English name for a black earth of a very remarkable structure, seeming of a mixed nature between the marbles, oclires, and clay; and usually containing a large quantity of the matter of the common vitriolic pyrites or ink-stone, which gives it a very sharp unpleasant taste, and makes it, when thrown on the fire, emit a slight blue flame of a sulphureous smell, and calcine to a deep red. It is common in many parts of England, Wales, and Ireland. It is lighter than any of the other clays, though that is the genus to which it most properly belongs; and it is of an uneven surface, and shattery structure.

KILLREA, in *Geography*, a post-town of Ireland, in the county of Londonderry; it is situated near the river Bann, and is 102 miles N. from Dublin.

KILLRUSH, a post-town of Ireland, in the county of Clare, and province of Munster. It is situated upon the river Shannon, and is a place of some trade, some of the merchants of Limerick having agents residing here. It is 142 miles S.W. from Dublin.

KILLUCAN, a post-town of Ireland, in the county of Westmeath, and province of Leinster; it is 28 miles W. by N. from Dublin.

KILLWORTH, a post-town of Ireland, in the county of Cork, Munster, situated on the river Funchcon. It has gone very much to decay, on account of the neighbourhood of Fermoy; it is 108 miles S.W. from Dublin, and 18 N.E. from Cork.

KILLYBEGS, a post-town of Ireland, in the county of Donegal, which, before the Union, was represented in parliament. It is situated on a creek, on the N. side of Donegal bay, and has an extensive herring-fishery; it is 124 miles N.W. from Dublin, and 13 miles W. from Donegal.

KILLY-HOLM, one of the smaller Orkney islands; about half a mile N. of Eglisha.

KILLYLEAGH, a post-town of Ireland, in the county of

of Down, and province of Ulster. It is situated on the W. coast of Strangford lough, and has a safe harbour for small vessels. Here sir Hans Sloane, the famous naturalist, was born, in 1660; it is 80 miles N. by E. from Dublin, and 15 S.S.E. from Belfast.

KILLYTH-STALLION, in our *Old Writers*, is where lords of manors were bound by custom to provide a stallion for the use of their tenants' mares.

KILMARNOCK, in *Geography*, a very industrious, thriving, manufacturing town in Ayrshire, Scotland, 22 miles S.W. from Glasgow. Its principal articles of staple manufacture are coarse woollens and carpets, and low priced gloves, besides which a great number of weavers are employed in the cotton trade by the manufacturers of Glasgow and Paisley. Kilmarnock is situated in a very fertile part of the country, and is very plentifully supplied with

coals from the extensive coal-works of sir William Cunningham of Caprington, which are in the immediate neighbourhood. Besides sir William Cunningham, the chief landed proprietors in this neighbourhood are, the dukes of Portland, and the counts of Loudon and Moira, both of whom here possess very large estates in their own right. The immense castle of Loudon, now building, will, when finished, be one of the noblest family-seats in Britain. Kilmarnock, not being a royal borough, has no elective franchise for a member of parliament. In 1801, it contained 8079 inhabitants, of whom 6757 were employed in trade and manufactures. N. lat. 55° 40'. W. long. 4° 27'.

KILMES, a town of Russia, in the government of Viatka; 28 miles N.E. of Malmisch.—Alto, a river of Russia, which runs into the Viatka; 32 miles N.E. of Malmisch.

END OF VOL. XIX.



